MARCH, 1960

Plant Engineering

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The magazine that helps plant engineers with their everyday problems

Volume 14, No. 3 Circulation of this issue 51,770

NEW! EC&M Front-Connected DC Control reduces catwalk width up to 20 inches

• When space is important, EC&M front-connected control can save you up to 20 inches of catwalk width. Moreover, the controllers are 10% to 15% lighter, can be backed up against girders. The result — a reduction in crane weight.

These new front-connected controllers provide the easiest maintenance of any available. All wiring and control components are accessible from the front, with ample working space inside the cabinet.

You get extra safety, too. Control components are mounted on insulated bases which in turn are mounted on panel studs projecting from the rear of the cabinet. The result is maximum insulation to ground.

EC&M front-connected control is available for single-motor DC drives up to 225 hp, with 2, 3 or 4 decks to suit headroom requirements. Includes exclusive Wright dynamic lowering circuit which gives maximum hook speed without danger of overspeeding.

Write for Bulletin 6121. Square D Company, EC&M Division, 4500 Lee Road, Cleveland 28, Ohio

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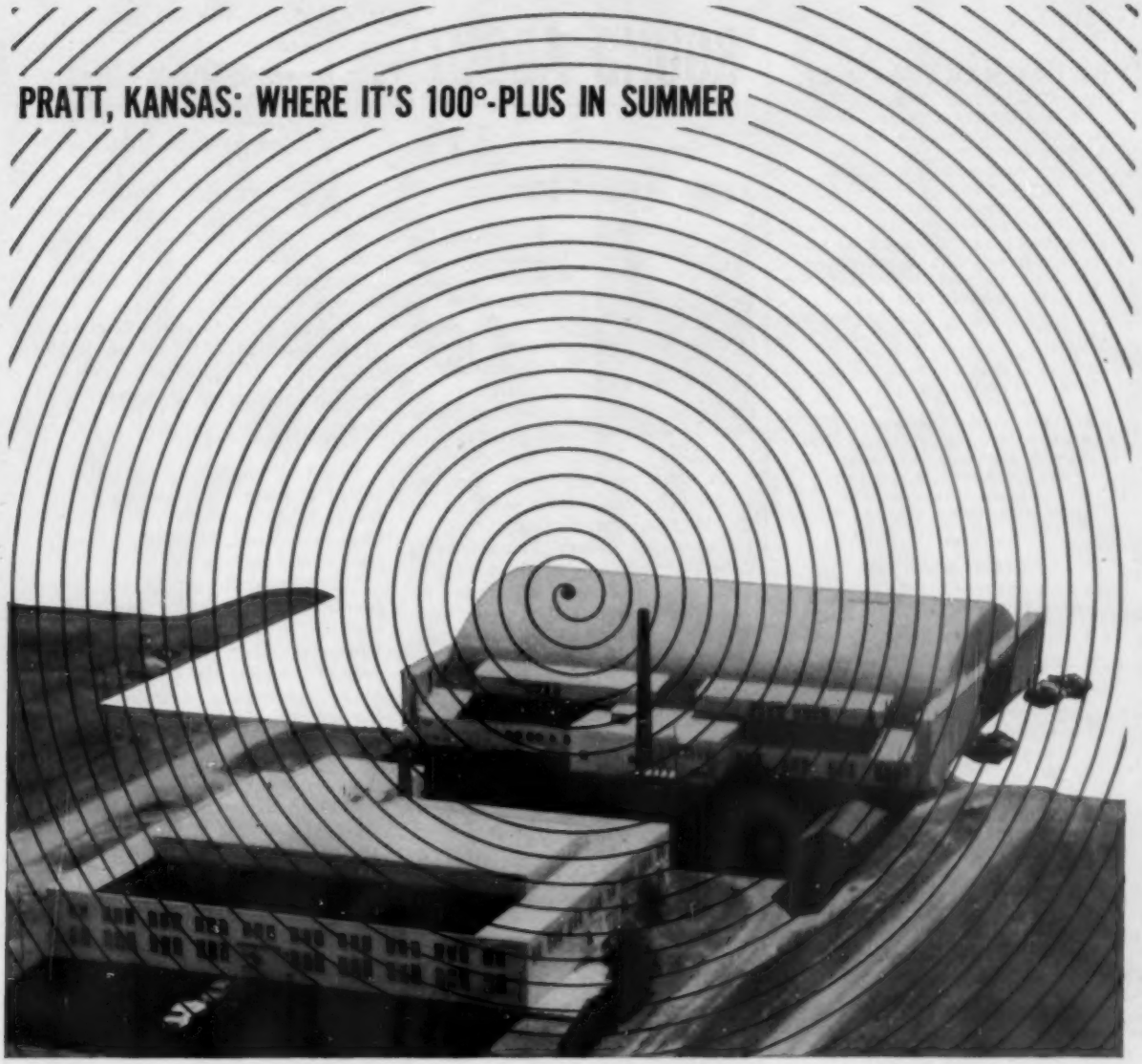
PRATT, KANSAS: WHERE IT'S 100°-PLUS IN SUMMER



Storm King Aluminum Coating restored these roofs at Pratt Municipal Airport, Kansas. Weatherproof, economical and highly visible, *Storm King* is made by the Warren Refining and Chemical Co., Cleveland 2, Ohio.

Storm King Aluminum Coating solves roof maintenance problem

The City of Pratt posed the problem to Art Waters Roofing Co. Roofs at Pratt Municipal Airport were cracked and dried out, no longer weatherproof or attractive. What new surface would stand up to 100°-plus temperatures in summer, rain and snow in winter?

Art Waters recommended and used Warren's *Storm King* Aluminum Coating, made with ALCOA® Pigments. Today, Pratt Airport buildings are cooler inside, weatherproof outside, appreciably less expensive to maintain. Independent tests have shown that a good aluminum coating will cut maintenance costs more than 30 per cent, reduce wide temperature variations under the roof.

Here's why. Good aluminum coatings such as *Storm King* combine pure ALCOA Aluminum flakes in a tough asphalt-asbestos base. The aluminum "leafs" to form a brilliant, metallic top surface that protects the vital oils from the sun, keeps the coating pliant and waterproof. And reflective aluminum turns back 70 per cent of the sun's heat, reduces inside temperatures as much as 15 degrees.

ALCOA does not make aluminum roof coatings, but we will be happy to refer you to reputable manufacturers who do. Write today for our free booklets, *Painting With Aluminum* and *Aluminum Roof Coatings Make Time Stand Still.* Use the coupon.

For more facts circle 502 on Reply Card

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'ROUND ABOUT

with the editors in field and office

Edited by R. L. Marinello

Manager of Plant Engineering

William H. Gordon has been named manager of plant engineering of the Aerojet-General Corporation, Downey, California.

He has been associated with the aircraft industry for over 20 years. His previous experience includes plant engineering positions for the Defense and Technical Products Division of Rheem Manufacturing Company and Douglas Aircraft Co.

A native of Kansas, he received his education in the Los Angeles area. His major course of study was mechanical engineering.

Experimental Layout Kit

HERE IS A handy layout kit which you can give an initial "try-out" on some of the layout problems you may have in your own plant.

The kit consists of a sheet of ¼-in. scale, two-dimensional templets, giving you an assortment of machine tools, materials-handling and office equipment, plus a ¼-in. scale film grid sheet.

With this kit you can make an experimental layout of an operation, using the adhesive backed film templets, process it through your blueprint or developing machine and secure a layout print.

If you would like one of these layout kits, send your request, on company letterhead, to Repro-Templets, Inc., 614 Allegheny R Blvd., Oakmont, Pa.

Lubrication Conference

TOPICS ON everything from the properties of lubricants to various equipment applications will be discussed at the American Society of Lubrication Engineers conference. It will be held in Cincinnati, Ohio, at the Netherland Hilton Hotel on April 19, 20 and 21.

The annual course on Lubrication Engineering will be held concurrently with the technical sessions and the highlight of this course will be a tour of the Cincinnati Milling Machine Company with emphasis on lubrication applications.

For more information on this conference, write to C. L. Willey, American Society of Lubrication Engineers, 84 E. Randolph St., Chicago 1, Ill.

English Engineering Students Seek American Experience

PLANT ENGINEERING recently received a letter from an engineering friend in England, W. R. Selwood, Chandler's Ford, Southampton, England, which reads in part:

"My 20 year old son and two of his friends are all very serious engineering students in Kings College, London University. They have just over one year to complete the course and they are anxious to come to America during the summer of 1960 to work to gain experience. Naturally, they would prefer some kind of engineering work but they are prepared to do anything and all three have had practical workshop experience in addition to having attained a very high standard in their academic studies. They will be available from the middle of June until the end of September."

Plant engineers wishing to help these young men gain American industrial experience or who know of any other companies that employ students during the summer months should contact Mr. Selwood at the address given above.

Radioisotopes in Industry

ARE YOU considering the use of radioisotopes in your plant? If you are, you will find the report recently compiled by the National Industrial Conference Board for the Atomic Energy Commission of interest.

The report contains the results of a survey conducted by this group among industrial users of radioisotopes. Some of the information sought in this survey was based on the following points:

A discussion of the general techniques involved in specific industrial applications.

A listing of other possible methods

Subscriptions: U.S.A. $10, Canada $11. Other countries $12 per year. Single copies $1. Change of address: Send to PLANT ENGINEERING, Circulation Division, Barrington, Illinois. Please supply position title, company name, company address. Request must reach us by the 15th of month to make the change effective with following month's issue. Published monthly and accepted as controlled circulation publication at Chicago, Ill.

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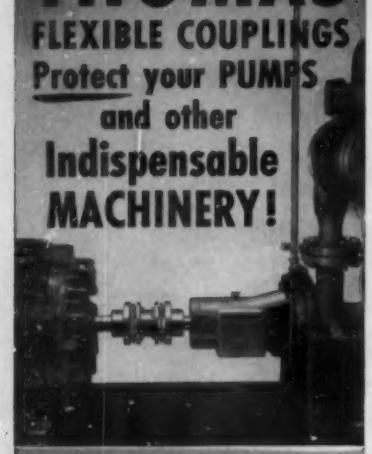

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'ROUND ABOUT

as substitutes for radioisotope applications.

Approximate costs involved in preparing facilities to use radioisotopes.

Savings in materials, labor costs, facility maintenance, and downtime from its use.

The report, Radioisotopes in Industry (NYO-2977), is available from the Office of Technical Services, U.S. Department of Commerce, Washington 25, D. C., and from the National Industrial Conference Board, 460 Park Ave., New York 22, N. Y. for $2.75 per copy.

Standard on Pallet Sizes

THERE ARE hundreds of different sizes of pallets made today, and the flexibility that could result from nationwide acceptance of a few standard sizes has been lacking. The American Standards Association hopes that this will be corrected as a result of a new standard on pallet sizes which has been prepared by one of the committees.

The principal objective of this standard is to provide an adequate selection from a minimum number of sizes, and to provide the maximum efficiency, economy, interchangeability and flexibility in rail, truck, air and maritime service.

This booklet, American Standard Pallet Sizes, MH1.1-1959, is available at $2 per copy from The American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y., or from the American Standards Association, 70 E. 45th St., New York 17. New York.

How To Work With Zirconium

IF YOU ARE now working with zirconium, you know about its unusual fire properties. If you are planning to work with it, you will have to organize your production and handling facilities accordingly. To assist you, the National Fire Protection Association has prepared a guide for its use.

In certain forms zirconium is pyrophoric and will ignite spontaneously and when once burning cannot be extinguished by conventional smothering agents. Water greatly accelerates combustion. However, in massive form the material does not readily burn.

All these properties are discussed in the pamphlet, Zirconium (NFPA No. 482M, 16 pages, 40 cents), which outlines safeguards for fire prevention, dust collection, fire protection and disposal of waste materials.

If you would like a copy of this booklet, send your request to National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass.

Water Treatment Service

NOW—THANKS TO the newly organized group Associated Laboratories it is possible to obtain information regarding water conditions in any part of the country. All member firms of this group are well versed and equipped with the engineering and chemical background and facilities to provide service to large and small industrial plants.

Associated Laboratories will welcome any inquiry with regard to water treatment for cooling towers, power plants, threshold and process water application and will, in turn, recommend a trained representative to service or consult, if so desired.

For further information about this service, write to Associated Laboratories, Detroit Headquarters, 26845 Southfield, Lathrup Village, Michigan.

Industrial Accidents

"WHO GETS HURT in industrial accidents?" is a question asked—and answered—by a new pamphlet published by the National Safety Council.

The pamphlet uses a humorous approach to discuss on-the-job injuries. It says the man who gets hurt is the man who thinks he is invulnerable.

In this 16-page booklet you will find out what type of worker is most likely to be accident-prone, how workers and their families are hurt in accidents, where accidents happen, what injuries cost the worker and his family and what you can do about accidents.

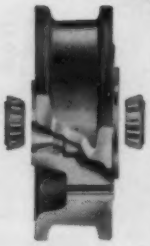
A single copy of "Who Gets Hurt?" may be obtained from the National Safety Council, 425 N. Michigan Ave., Chicago 11, Illinois.

Transistor Circuits Workshop

EIGHT PRACTICAL workshops on transistor circuitry are being sponsored by the Chicago Section of the Institute of Radio Engineers. The workshops will be held on eight consecutive Wednesday evenings, beginning March 30, in Lane Technical High School, 2501 W. Addison Blvd., Chicago, Illinois.

If you wish to receive more information or register for this workshop series, write to Scanfax, Room 2104, 228 North La Salle Street, Chicago 1, Illinois.

It Costs Far Less to Build a Crane Locally from Wright Matched Components!



TREAD WHEELS
Made of special car wheel iron with the tread deep chilled to a hardness of 450-500 Brinell. Tapered tread is self-aligning.

END TRUCKS
Welded steel channel construction with heavy steel plate diaphragms. Squaring shaft of ground and polished steel.

CRANE DRIVE UNIT
Consists of electric motor and well-proportioned gear reduction. Solenoid "drag" brake. Size 1—motors up to 2 HP. Size 2—3 or 5 HP motor.

• Now, buy a dependable WRIGHT B-514 Top Running Single Bridge Crane the modern, money-saving way! Here's all you do! Instead of paying shipping costs on a complete crane, order only the matched components—from your nearby WRIGHT distributor. Then, buy heavy I-beam structurals from a local source. This way you realize big savings by greatly reducing freight charges. WRIGHT furnishes an information sheet showing structural components which can be bought locally to complete the assembly.

A FEW OF THE WRIGHT B-514 FEATURES:

Controls • Single-speed push button controls are furnished with fluid-drive models, variable-speed push button controls with models without fluid drive. Variable speed controls have five selective speeds for speeding and slowing crane travel.

Fully Integrated Electrical Controls for the B-514 assembled locally with a WRIGHT Hoist and WRIGHT Crane Drive Unit are factory-installed at no extra charge.

Two Timken Roller Bearings to each wheel. Placed in opposition to one another, they compensate for radial and thrust loads.

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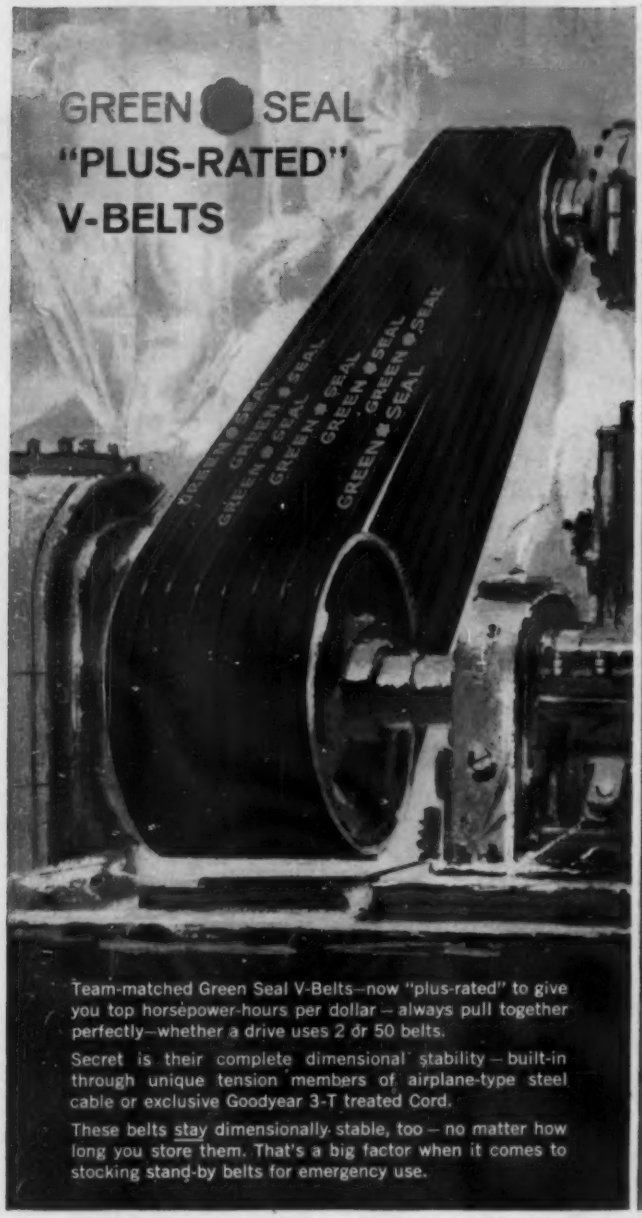
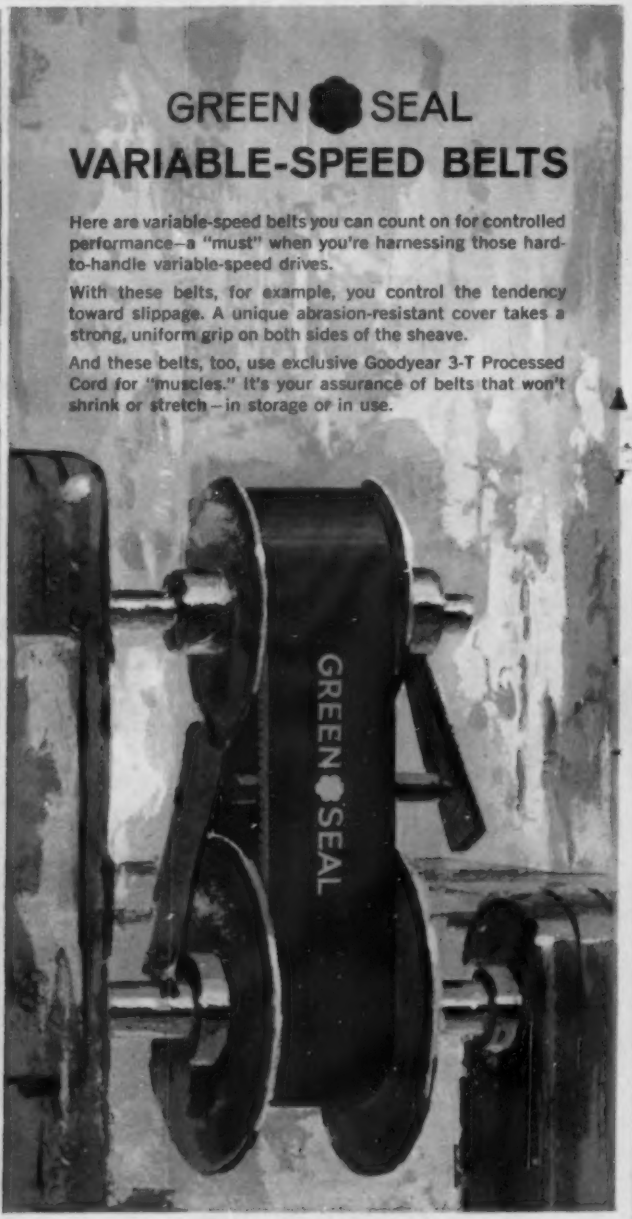
to beat all your belting problems...



Team-matched Green Seal V-Belts—now "plus-rated" to give you top horsepower-hours per dollar—always pull together perfectly—whether a drive uses 2 or 50 belts.

Secret is their complete dimensional stability—built-in through unique tension members of airplane-type steel cable or exclusive Goodyear 3-T treated Cord.

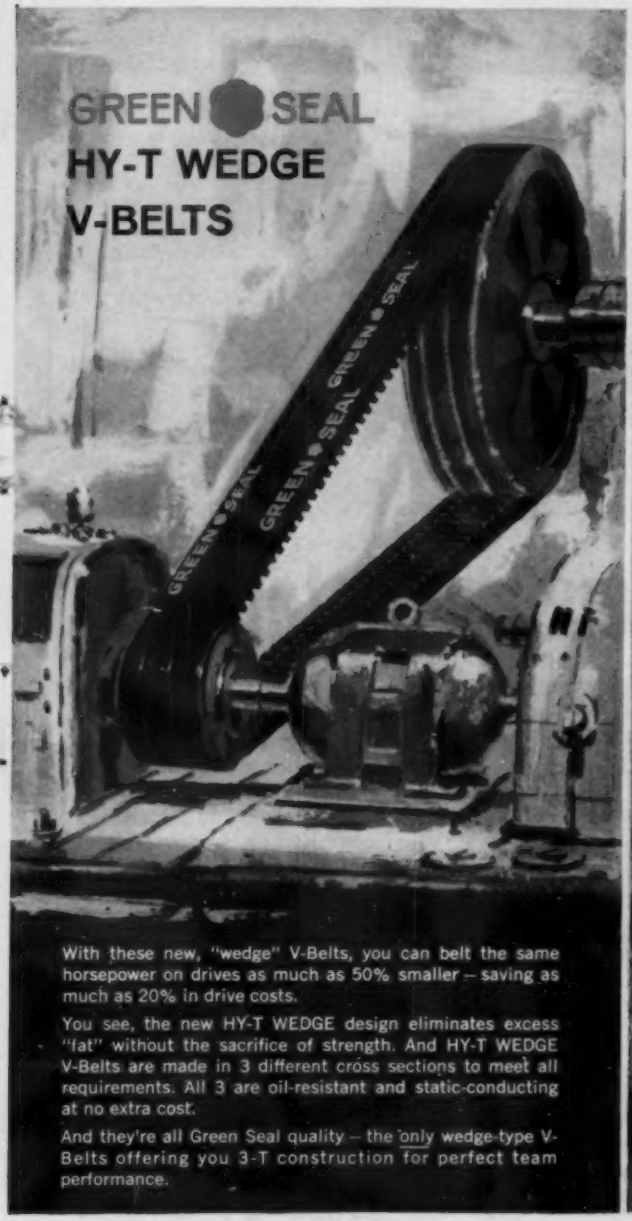
These belts stay dimensionally stable, too—no matter how long you store them. That's a big factor when it comes to stocking stand-by belts for emergency use.


GREEN SEAL
VARIABLE-SPEED BELTS
Here are variable-speed belts you can count on for controlled performance—a "must" when you're harnessing those hard-to-handle variable-speed drives.
With these belts, for example, you control the tendency toward slippage. A unique abrasion-resistant cover takes a strong, uniform grip on both sides of the sheave.
And these belts, too, use exclusive Goodyear 3-T Processed Cord for "muscles." It's your assurance of belts that won't shrink or stretch—in storage or in use.
GREEN SEAL

NO MATTER WHAT YOU'RE BELTING—OR WHAT TYPE BELT IT CALLS FOR—YOU CAN COUNT ON A GOODYEAR BELT FOR MAXIMUM TROUBLE-FREE HOURS AT MINIMUM COST. JUST CONTACT THE

THE BIG NAME IN V-BELTS: **GOODYEAR**

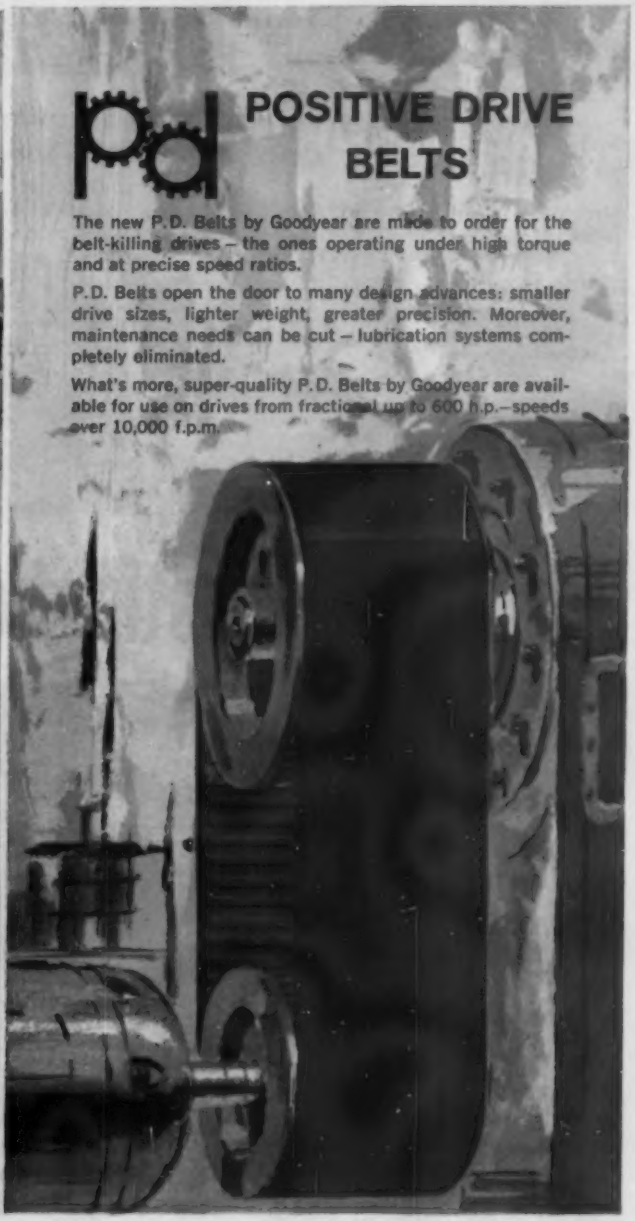
go down the line with Goodyear



With these new, "wedge" V-Belts, you can belt the same horsepower on drives as much as 50% smaller – saving as much as 20% in drive costs.

You see, the new HY-T WEDGE design eliminates excess "fat" without the sacrifice of strength. And HY-T WEDGE V-Belts are made in 3 different cross sections to meet all requirements. All 3 are oil-resistant and static-conducting at no extra cost.

And they're all Green Seal quality – the only wedge-type V-Belts offering you 3-T construction for perfect team performance.



The new P.D. Belts by Goodyear are made to order for the belt-killing drives – the ones operating under high torque and at precise speed ratios.

P.D. Belts open the door to many design advances: smaller drive sizes, lighter weight, greater precision. Moreover, maintenance needs can be cut – lubrication systems completely eliminated.

What's more, super-quality P.D. Belts by Goodyear are available for use on drives from fractional up to 600 h.p.–speeds over 10,000 f.p.m.

G.T.M.–GOODYEAR TECHNICAL MAN–THROUGH YOUR GOODYEAR DISTRIBUTOR. OR WRITE: GOODYEAR, INDUSTRIAL PRODUCTS DIVISION, LINCOLN 2, NEBRASKA, OR AKRON 16, OHIO.

YEAR

THE GREATEST NAME IN RUBBER

Green Seal, HY-T WEDGE, P.D.–T.M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

For more facts circle 506 on Reply Card

MODERN MAINTENANCE

IS PROFITABLE MAINTENANCE

R. L. Kirkpatrick, *Manager, Maintenance Sales*, Westinghouse Electric Corporation

For Production Reliability . . . Don't Just Repair, Modernize

A good maintenance program contributes to a profit by preventing down time, dislocated schedules, spoilage—in short, production losses. Management must recognize these facts and establish a sound modern maintenance program.

The day of wishful fixing or patching of equipment is over. Maintenance and Production management must carefully analyze the present and future demands on all production equipment. Performance records are essential. The ever-increasing use of automatic controls and devices demands greater reliability of all elements in the production process. Failure anywhere along the line will cause down time costing from $5 to $1000 or more per minute. No plant can afford production interruptions on this scale, especially if recurrent—and unnecessary.

Sound maintenance practices demand that equipment be modernized for maximum reliability for the service it is to perform—not just repaired. As an example, motors today are rebuilt, uprated—to improve per-

Here's how Westinghouse maintenance

Precision planning saves customer $25,600

Like a checker game against "time," a 13,000-hp synchronous motor rotor was to be changed out with the fewest possible moves. One hour of unplanned hot mill outage would cost $3200 in lost production directly . . . and cold mill shutdown upon depletion of hot strip reserve.

A scale model of the motor-generator set was built by Westinghouse Field Service Engineers —every move, clearance and individual responsibility were programmed. At zero hour, equipment was tripped off line, rotor removed, the new one installed, bearings fitted, the entire assembly realigned . . . no delays, no accidents. Most importantly, the entire job was accomplished 8 hours ahead of the 96-hour scheduled shutdown, providing the customer with an extra $25,600 of production.

Had the three-quarter million-dollar M-G set been damaged in removal of this rotor, prolonged and expensive down time would have resulted. Precision planning was essential to circumvent clearances of no more than an inch or two.

Super Coilife insulation withstands severe chemical attack

The 40-hp drip-proof motors driving hydraulic pumps used to test jet airliners before flight failed after two weeks in service. Hydraulic fluid had proved too much for a conventional insulation system—a chemical reaction from splash and fumes caused motor failure.

Preparatory to repair, the Westinghouse Seattle Repair Plant tested Super COILIFE* insulation in the hydraulic fluid. Based on complete success of tests, the motors were rewound. Three months after being placed back in service, these newly protected motors are performing smoothly. Westinghouse exclusive Super Coilife is giving positive protection from this chemical attack.

*Trade-Mark

The motor with at least nine lives

Here is a motor that has been periodically drowned . . . but, thanks to Super Coilife, will have a long, useful life. This 50-hp unit drives the main pump for the plant's steam supply. The company's

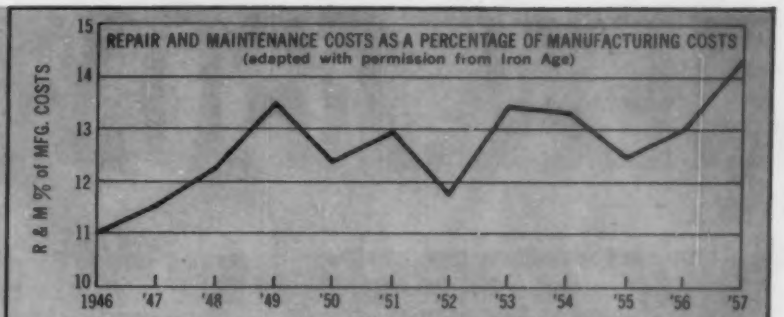
"Hello, Westinghouse? We've got a problem."

formance, to lengthen useful life, to meet present and future demands. Newly developed insulations with higher thermal characteristics can be used in rewinding motors to meet experienced or expected higher operating temperatures. Mechanical changes to meet the improved electrical operation can and must be made at the same time. When equipment is out of service for repair, these steps may be taken at a minimum additional cost, and provide rebuilt equipment that will last and last. This is modernization that prevents recurrent and unnecessary failures.

Developments in modern product and component design can fortify your present equipment in many ways. Encapsulation of windings, for instance, will provide positive protection against airborne chemicals, moisture or dust. Complete engineering analysis of a dismantled motor will reveal how new and improved materials and processes can give you back a motor that will be better than when it was new.

Just as a preventive maintenance program plans repair work into production schedules, so, too, modernization of equipment should be planned into repair schedules. Make-shift maintenance won't do. Modernize capital equipment so that it will do what it is required to do . . . to produce and keep producing profitably.

This is one of a series of Westinghouse articles on profitable maintenance practices.

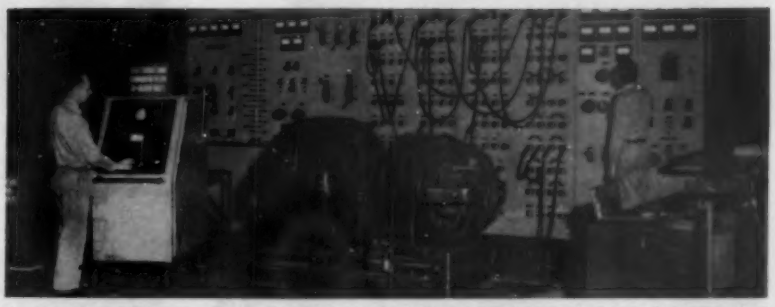


Repair and maintenance costs are increasing faster than total manufacturing costs. The above chart shows the 10-year relationship in nine major steel companies, where the percentage rose from 11% to 14.5%.

service assures lower over-all costs

riverside site is subject to basement floods . . . complete immersion of the motor caused original failure.

The Westinghouse Bridgeport Repair Plant rewound the stator with Super Coilife. After one month back on the job, the motor was once again found submerged. Water was pumped away and the motor was started immediately. Four months later it's still running . . . and future reliable operation is assured with Super Coilife.



A comprehensively equipped test board in a typical Westinghouse Repair Plant. Final electrical and running tests on rebuilt rotating equipment are made with this special facility.

Pulp mill motors uprated from 450 to 650 hp: fortified with Thermalastic insulation

An Alaskan plant now boasts three motors that in power and overload capacity are better than when new. Increased production demands were overloading these 450-hp drive motors. Measurements showed that temperature rises were reaching dangerous levels.

Westinghouse proposed complete redesign of coils and the rebuilding of all motors on an emergency — but planned — basis. Westinghouse delivered the first unit, a rewound and uprated stand-by stator, for substitution in the first motor. The planned shutdown was met; not an hour's production was lost. The exclusive Westinghouse Thermalastic® insulation process was used and forced ventilating coolers were installed. This electrical and mechanical modernization uprated these motors 44%.

Three Westinghouse work-together maintenance services are close by and ready to assist you in the repair and modernization of your equipment. In any industrial area of the country, you will find Westinghouse Repair Plants, Renewal Parts Warehouses and Field Service Engineering offices. Westinghouse Maintenance services are available to you on an around-the-clock basis.

In the modernization and rebuilding of your equipment, Westinghouse gives you the very latest materials, components and techniques . . . and a new equipment guarantee. Get in touch with your Westinghouse representative for skilled help in analyzing your maintenance problems. He can show you why it is profitable to modernize. J-95211

YOU CAN BE SURE...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV ALTERNATE FRIDAYS

For more facts circle 507 on Reply Card

NEW...FROM TUBE

FROM YOUR TUBE TURNS' DISTRIBUTOR

The complete line of PIPE-MATE Fittings, Flanges and Accessories are available from your nearby Tube Turns' Distributor. For pipe sizes ½" to 4"... Schedules 5S and 10S... in Types 304L, 316 and 316L.

TURNS...

PIPE-MATE light-wall stainless steel fittings and flanges

Tube Turns introduces another important key to lower piping costs . . . a new line of light-wall stainless steel fittings and flanges for process piping. Here's how this PIPE-MATE* line reduces costs . . .

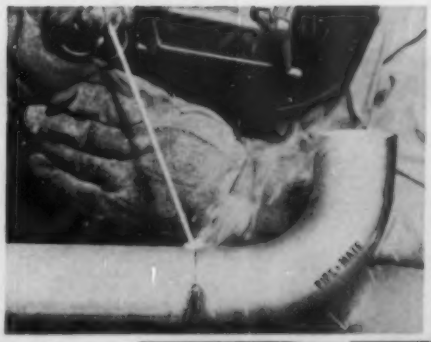
Cuts material costs. Compared to standard weight Schedule 40S pipe, *light-wall* piping in Schedule 5S or 10S cuts material costs as much as 30% to 50%. It weighs ½ to ⅓ as much, is easier to handle, easier to install and provides greater flow area.

Simplifies installation. Extra long tangents of PIPE-MATE fittings provide full straight-line clearance for fitting-to-fitting connections and permit fabrication of completely flanged elbows, returns, tees, etc. Aligning connector speeds making of socket type joints. Fittings may be butt-welded, fillet-welded, brazed or soldered, or joined by rolled-in flange connections.

Here is another plus value you get when you specify products of Tube Turns and buy them from your Tube Turns' Distributor.

FREE BULLETIN on PIPE-MATE Fittings and Flanges describes complete line, shows installation procedures, and gives properties and dimensional tolerances. Mail coupon for copy.

*"PIPE-MATE" and "tt" are trademarks of Tube Turns.



FOR BUTT-WELDING

FOR FILLET-WELDING, BRAZING OR SOLDERING

FOR ROLLED-IN FLANGED JOINTS

Another tt *plus value from...*

TUBE TURNS

DIVISION OF CHEMETRON CORPORATION

Louisville 1, Kentucky

CHEMETRON

DISTRICT OFFICES: Atlanta • Buffalo • Chicago • Columbus • Dallas • Denver Detroit • Houston • Kansas City • Los Angeles • Midland • New Orleans New York • Philadelphia • Richmond • San Francisco • Seattle • Tulsa

IN CANADA: TUBE TURNS OF CANADA LIMITED, Ridgetown, Ontario
DISTRICT OFFICES: Edmonton • Montreal • Toronto

TUBE TURNS
Department PE-3, 224 East Broadway
Louisville 1, Kentucky

Please send bulletin TT944AR.

Company Name _____

Company Address _____

City _____ *Zone* ____ *State* ____

Your Name _____

Position _____

For more facts circle 508 on Reply Card

"We helped a customer stop frequent outages and get safe motor protection . . . by recommending FUSETRON Fuses"

OSCAR O'NEAL SR., PRES.
O'NEAL ELECTRIC CO., GULFPORT, MISS.

Play Safe! install FUSETRON dual-element FUSES

Mr. O'Neal continues . . .

"Sometime ago, the Gulfport Ice Co., called us in to do their electrical maintenance work. At the time, they were having a great deal of difficulty with motor starting currents causing ordinary fuses to blow. They were using 100, 200 and 400 amp. ordinary fuses to protect the motors.

"These frequent outages disrupted the company's normal operation and created a costly and annoying situation. Just to replace the 400 amp., 250 volt ordinary fuses was costing them about $40 a month.

"My first recommendation to them was to change to Fusetron dual-element fuses in the proper size for safe motor protection. They did.

"The installation of Fusetron fuses was the 'key' to the problem. In the past five years I do not recall one 400 amp. Fusetron fuse having blown — and outages on the 100 and 200 amp. circuits have been very infrequent."

YOU TOO, CAN GUARD AGAINST UNNECESSARY OUTAGES OR MOTOR BURNOUTS THAT CAUSE MEN AND MACHINERY TO STAND IDLE SIMPLY BY INSTALLING FUSETRON DUAL-ELEMENT FUSES THROUGHOUT THE ENTIRE ELECTRICAL SYSTEM.

In addition to saving you money by protecting against needless outages and motor burnouts

FUSETRON Fuses offer High Interrupting Capacity and Life-Time Dependability Essential to Modern Protection.

High Interrupting Capacity: With electrical network capacities steadily increasing, — a *modern* protective device must be capable of interrupting the heavy fault currents now available and to be adequately safe to allow for anticipated growth in service demands.

FUSETRON fuses give you this protection. They have an exceptionally high interrupting rating of 100,000 amperes rms symmetrical.

Life-Time Dependability: The increase in available fault currents has emphasized the need for dependability in modern protective devices, otherwise, serious fire and personal injury can result should the device fail to operate when an emergency arises.

FUSETRON fuses provide safe and accurate protection through the years as their operation depends on a simple thermal law. Unlike mechanically operated devices, Fusetron fuses have no hinges, pivots, latches or contacts to stick or get out of order.

Once properly installed, Fusetron fuses require no maintenance, — no periodic inspection and accompanying down-time.

If you are considering a new installation or the modernization of an electrical system — you can be sure of modern, safe, maintenance-free protection in 10 or 20 years by installing Fusetron dual-element fuses now.

For more information on FUSETRON dual-element fuses . . . Write for bulletin FIS.

BUSSMANN MFG. DIVISION
McGraw-Edison Co.
St. Louis 7, Mo.

300

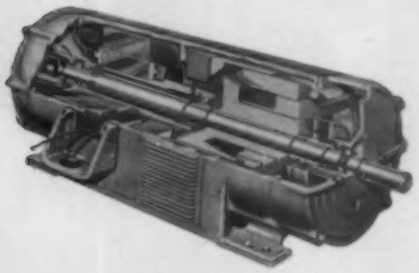
throughout entire Electrical System!

FUSETRON — TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION — BUSS — McGRAW EDISON

For more facts circle 509 on Reply Card

What do you need in an adjustable speed drive?

7½-hp Ajusto-Spede Drive



Common motor-drive housing for units up to 7½ hp saves space — can be foot or flange mounted. Larger sizes up to 100 hp with individual motor and drive housings mounted integrally.

NEW design news from Louis Allis

...The Louis Allis AJUSTO-SPEDE® drive is more compact, precise, and trouble-free

Here's an adjustable speed drive that allows *truly precise* machine operation. Speed regulation is automatic and stepless — results in faster, more efficient production at lower cost, with less waste, and minimum wear on equipment.

These and other benefits are yours when you use the improved Louis Allis Ajusto-Spede drive. For example, it can be set before or during operation to deliver any desired speed within its range. Its *exclusive* tachometer feedback circuit monitors the output speed and *automatically corrects speed and holds it* regardless of load changes.

This improved drive requires minimum maintenance. Its stationary field has no brushes, commutators, or slip rings to cause trouble. The source of power is an equally trouble-free standard a-c squirrel cage motor. The cast-iron housing keeps out dirt, chips, and moisture — resists corrosion.

The compact Ajusto-Spede also saves space. Integrally-mounted motor and drive simplify handling — can be easily adapted for installation on new or existing machines. Controls can be mounted at the machine or any other convenient position.

The Louis Allis Ajusto-Spede drive is the practical solution to almost every application that requires dependable, easily controlled adjustable speed. It is the answer to precise operating speeds for machine tools, process machinery, test equipment, windups, conveyors, printing presses, and other equipment. Contact your Louis Allis District Office for information and application help. Or write for bulletins 2750 and 2800 — The Louis Allis Co., 434 East Stewart Street, Milwaukee 1, Wisconsin.

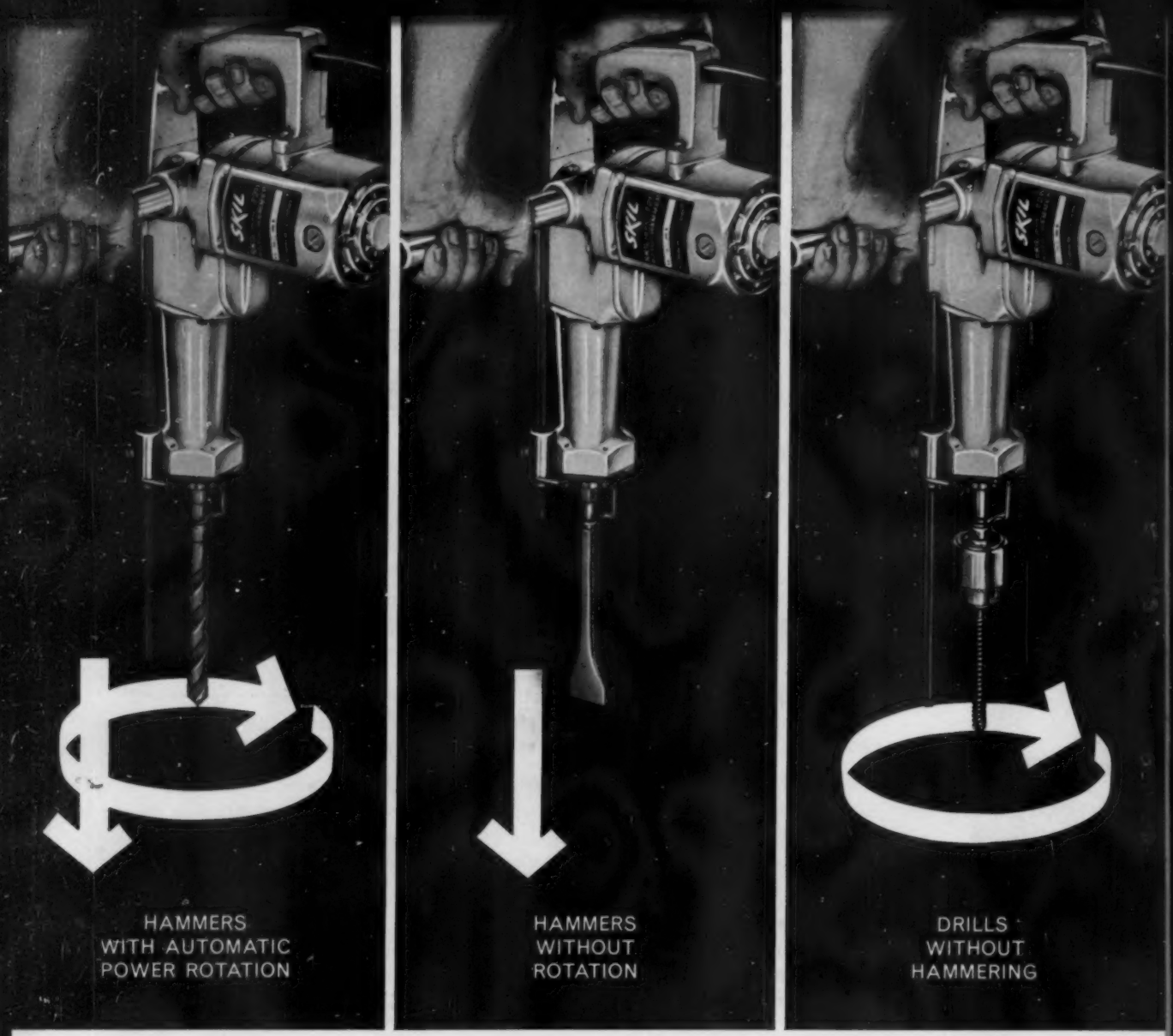
® Ajusto-Spede is a registered trademark of the Eaton Mfg. Co.

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

LOUIS ALLIS

ASD-127

For more facts circle 510 on Reply Card



New! Revolutionary Skil Roto-Hammer

Exclusive 3-way action obsoletes all other electric hammers!

It's actually 3 different tools in one:

Powerful hammer with automatic power rotation that drills holes in masonry up to 65 times faster than by hand . . . up to 5 times faster than ordinary hammers . . . without tiresome rotation of star drills.

Hammer without rotary action for all kinds of hammering jobs, including channeling, routing, chiseling, riveting, demolition work, setting self-drilling anchors.

Drill without hammering action for boring holes in masonry, wood, metal, or any material that can be drilled with standard electric drills.

Costs per hole are lowest of any hammer (see chart). Maintenance costs are lowest, too, because of unique "electro-pneumatic" drive. No springs to break . . . powerful hammering is air actuated.

Ask your Skil distributor for demonstration of Model 726 (½-1 inch) and Model 736 (1-2 inch). Or write for 8-page brochure. Skil Corporation, 5033 Elston Ave., Chicago 30, Ill. Attention: Dept. 120C.

LOWEST COST PER HOLE
Based on 1000 holes (⅜" x 4" deep) in masonry—labor at $3.00 per hr.

SKIL NO. 726 HAMMER	ORDINARY HAMMER
1 Carbide Bit* needed	24 Star Drills needed
19.38 hours of labor	100.4 hours of labor
$80.14 (labor & bit)	$337.20 (labor & bits)
8¢ per hole	34¢ per hole

*New SKIL Carbide Bits stay sharp 20 to 30 times longer than star drills.

SKIL ... and SKILSAW POWER TOOLS

For more facts circle 511 on Reply Card For more facts circle 512 on Reply Card →

New from American-Standard
Industrial Division

Air-Lift† for Industrial Plants

...helps you control total inplant environment

Air-Lift . . . a new concept of coordinated products and services from American-Standard Industrial Division . . . can help raise the productivity and profitability of your business through better control of air conditions throughout your plant.

To see how Air-Lift works . . .

← LIFT THE FLAP

† Service-mark of American-Standard

American-Standard Industrial Division AIR-LIFT IN ACTION

BETTER AIR . . . profitable firs

in plant modernizatio

Boiler Room

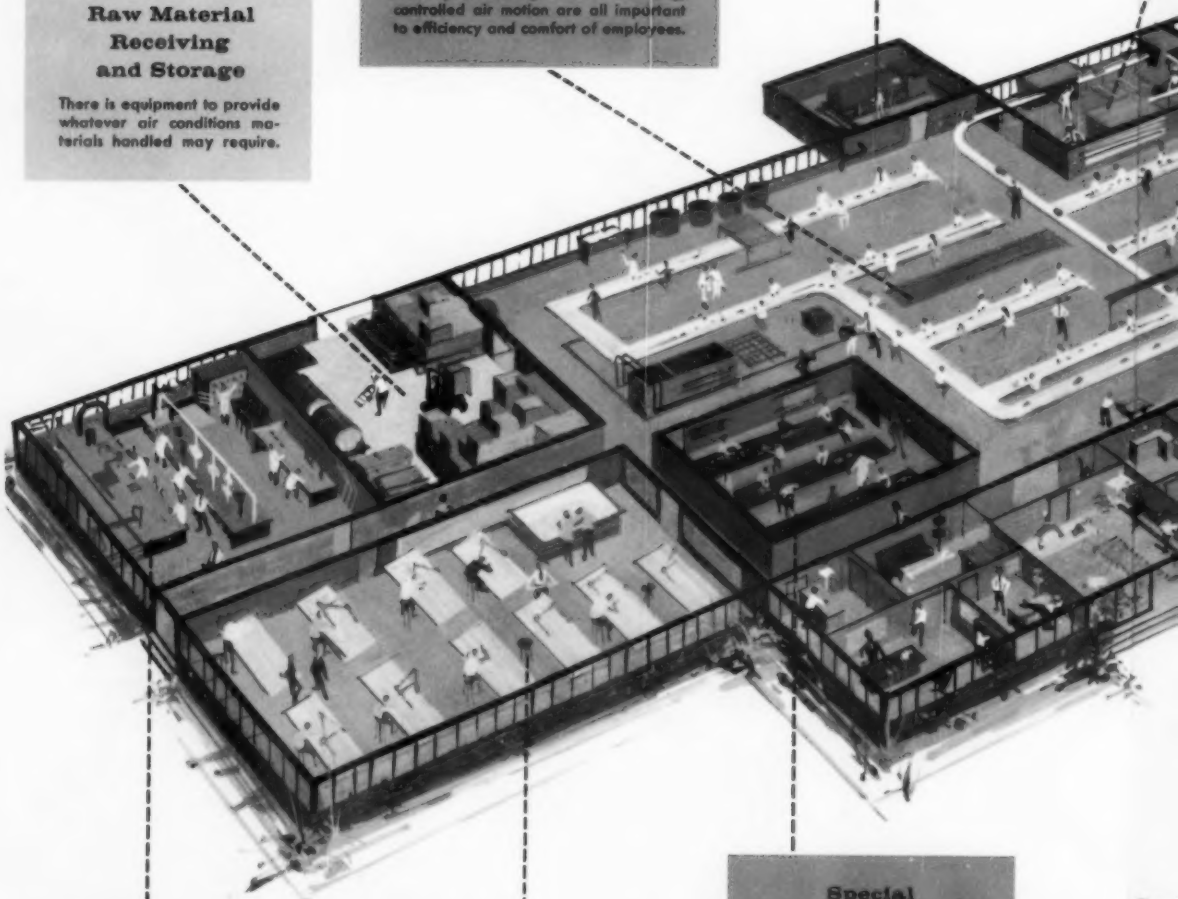
Ventilation and air circulation required. Frequently there is provision for winter heating.

Manufacturing Area

Heating, ventilating or air conditioning, controlled air motion are all important to efficiency and comfort of employees.

Raw Material Receiving and Storage

There is equipment to provide whatever air conditions materials handled may require.



Research

Certain types of laboratory work present severe hazards to employee health, require close control of dust, fumes, vapors, gases, air velocities.

Engineering

Air conditioning pays dividends in accuracy. Employees are more efficient, more alert in comfortable environment.

Special Assembly

Highly specialized equipment can provide air conditions to order . . . control temperature, humidity, air motion, and air cleanliness with precision.

Cont
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rst step

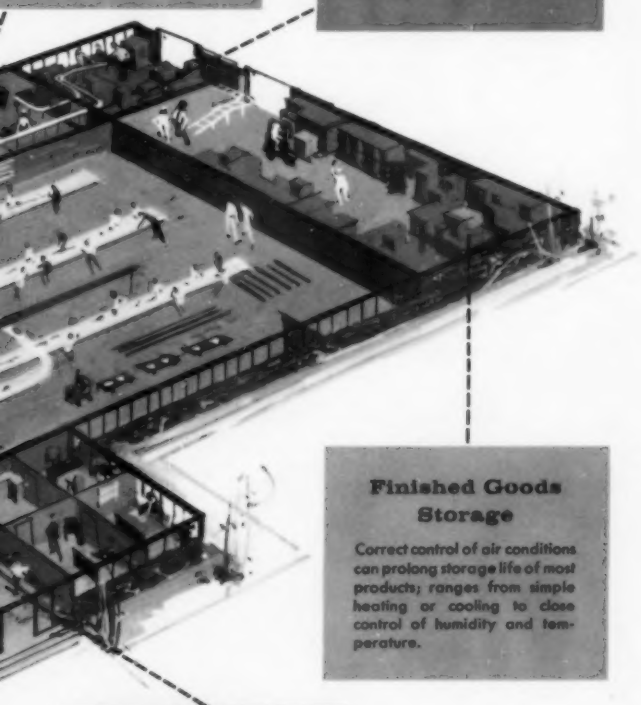
on programming

Finishing Room

Atomized paint, fumes, odors paramount problems here. Efficient exhaust and makeup-air equipment is essential.

Shipping

Heaters with duct extensions can blanket outside entrance doorway with warm air curtain.



Finished Goods Storage

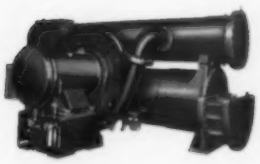
Correct control of air conditions can prolong storage life of most products; ranges from simple heating or cooling to close control of humidity and temperature.

Offices

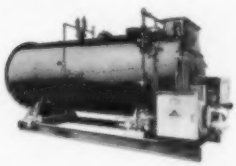
Year-round climate control (summer cooling, winter heating) lifts employee morale . . . helps to reduce absenteeism.

ontrol of inplant environment varies from simple ventilation precise regulation of temperature, humidity, air movement, and air cleanliness. American-Standard Industrial Division offers products to handle the entire job. These re the products of Air-Lift. Long experience has given merican-Standard Industrial Division product specialists realistic understanding of the many problems involved. is yours to draw on in selecting a system of components r the air conditions you need. This is Air-Lift service.

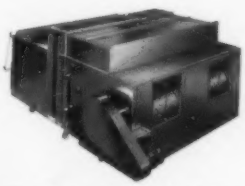
One-source responsibility for systems or components that meet your needs



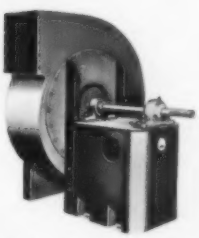
Centrifugal refrigerating machines for central-station systems.



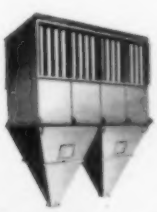
Firebox, scotch-type steel boilers, package units for heat, steam.



Central-Station air-conditioning units for cooling and heating.



Industrial fans with wheel types for air, gases, materials, shavings.



Dust collectors and fly ash collectors for effective air cleaning.

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One-source responsibility

The heart of American-Standard Industrial Division's Air-Lift Service

Now . . . with the combined American Blower, Ross Heat Exchanger, and Kewanee Boiler product lines . . . American-Standard* Industrial Division offers *all* the major components for complete, integrated systems to control inplant environment.

You benefit by getting air-conditioning, air-handling, heating, and air-pollution-control equipment designed, engineered, and manufactured to work together. And—most important—you have one-source responsibility for its quality and performance.

Offices in all principal cities are staffed by product specialists whose practical knowledge of equipment selection and application may prove most helpful to you. May we serve you? AMERICAN-STANDARD INDUSTRIAL DIVISION, DETROIT 32, MICHIGAN. IN CANADA: AMERICAN-STANDARD PRODUCTS (CANADA) LIMITED, TORONTO, ONTARIO. EXPORT DIVISION, AMERICAN-STANDARD, NEW YORK CITY.

Products designed, engineered, and manufactured to work together

AIR CONDITIONING

Centrifugal refrigerating machines • Central station units • Fancoil units • Self-contained air conditioners • Package water chillers • Multi-zone air conditioners • Sprayed coil dehumidifiers • Heating and cooling coils • Air washers

AIR HANDLING

Industrial fans with wheel types for handling air, gases, materials, and shavings • Centrifugal, propeller, tubeaxial, and vaneaxial fans • Utility sets • Power roof ventilators • Centrifugal compressors • Specialized fans, blowers

HEATING

Firebox, scotch-type steel boilers and package units for heat, process steam • Vertical and horizontal unit heaters for steam or hot water • Heavy-duty heating coils • Industrial unit heaters • Heating and ventilating units • Cabinet heaters

AIR POLLUTION CONTROL

Dust collectors and fly ash collectors for eliminating dust and recovering fly ash • Cyclone-type centrifugal dust collectors • Disposal systems • Tubular-type centrifugal collectors • Package units • Electrostatic precipitators

POWER TRANSMISSION

Gyrol® Fluid Drives for stepless, adjustable-speed control of driven machinery • Complete range of sizes, 1 hp thru 12,000 hp • All provide extremely smooth pickup of the load, affording maximum protection for motor and machine

HEAT TRANSFER

Standard and engineered heat exchangers, condensers, and feedwater heaters for every requirement • Oil and gas coolers • Refrigeration condensers and coolers • Instantaneous water heaters for service-water, booster, convertor duty

*American-Standard and Standard® are trademarks of American Radiator & Standard Sanitary Corporation.

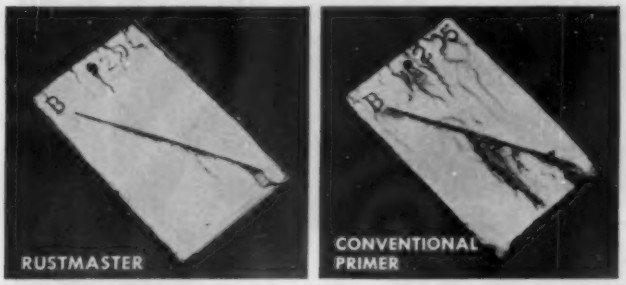
AMERICAN-Standard
INDUSTRIAL DIVISION

AMERICAN BLOWER PRODUCTS • ROSS PRODUCTS • KEWANEE PRODUCTS

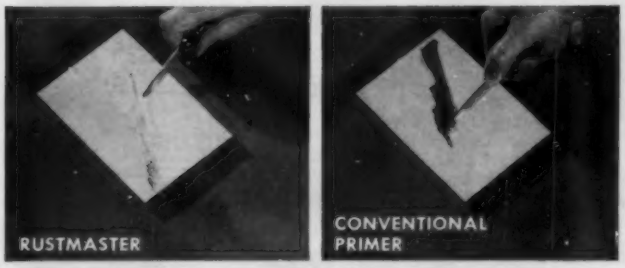
Revolutionary Metal Primer...

RUSTMASTER

PROOF OF BETTER ADHESION—Rusted metal sheets were coated with primers and finish coats and exposed to weatherometer at 95 degrees and 95 per cent humidity for 300 hours. They were then subjected to severe bending in conical mandrel. Conventional primer cracked and broke away from surface. RUSTMASTER showed little sign of stress revealing far greater flexibility and adhesion.



PROOF OF BETTER ENDURANCE—In salt spray test, metal panels were coated with primers and finish coats and scribed to bare metal. Panels were then subjected to salt spray test for 500 hours. "Conventional" panel had severe blistering and under-film corrosion. RUSTMASTER restricted corrosion to scribed area, proving higher anti-corrosive qualities.



PROOF OF BETTER PROTECTION—Primers were applied to rusted metal panels and exposed to weatherometer test for 1600 hours. Scraping of both panels with knife blade showed that conventional primer pigment remained on the surface of the rust. RUSTMASTER vehicle and anti-corrosive pigments were bound into the rust, proving deeper penetration, more protection.

Penetrates rust faster and more thoroughly, dries faster, and gives better protection

Secret to the remarkable RUSTMASTER performance is a special surface wetting additive*. This additive gives the vehicle and pigment in RUSTMASTER superior penetrating power through rust which remains after average surface preparation.

This protective primer pierces tight rust layers and actually forces its way to the metal surface. Once there, it bonds firmly with the substrate, driving out corrosive moisture and air remaining in microscopic pores. This bonding action produces an extremely strong, flexible, durable finish.

The swift penetrating action of RUSTMASTER makes it fast-drying, too—waiting period before applying finish coat is now hours instead of days.

So successful have been exhaustive laboratory tests, that RUSTMASTER wetting agent is now being extensively field tested by the Lead Industries Association in formulas for Red Lead and Modified Red Lead Primers, and is included in experimental formulations recommended by the Association to industry for field testing.

Write on your company letterhead for complete information.

For most efficient protective maintenance systems, use RUSTMASTER with recommended Glidden finish coatings.

*Patent applied for

QUALITY Glidden PRODUCTS — General Paint

COATINGS FOR EVERY PURPOSE

The Glidden Company
MAINTENANCE FINISHES DIVISION
900 Union Commerce Building
Cleveland 14, Ohio

In Canada: The Glidden Company, Ltd., Toronto, Ontario

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NEW!

QT
SOUND CONTROL CURB

JENN-AIR

90%

Reduces sound power

for whisper-quiet efficient power exhauster ventilation

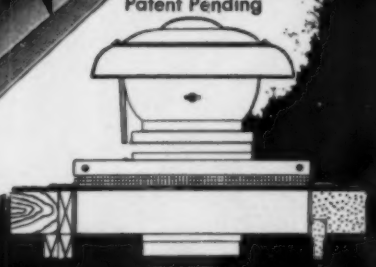
● After years of intensive research, Jenn-Air is proud to announce the QT SOUND CONTROL CURB—**the most important noise control development in power exhauster history!** Jenn-Air QT SOUND CONTROL CURBS absorb 90% of an exhauster's inlet sound power . . . while maintaining air moving efficiency at better than 90%. Verified by independent laboratory tests, this amazing performance gives you the long-sought key to practical noise attenuation. Check with your Jenn-Air representative for full details on how QT SOUND CONTROL CURBS can solve your ventilator noise problems.

- **The QT SOUND CONTROL CURB** absorbs, in just 10" of space, as much noise as 18 feet of lined duct 14" in diameter and 1" thick.
- **The QT SOUND CONTROL CURB** produces a speed reduction equivalent to 43% of actual speed . . . a 1725 rpm fan, for example, sounds as though it were turning at 980 rpm.
- **The QT SOUND CONTROL CURB** reduces a power exhauster's sone value (apparent loudness to the human ear) by approximately two-thirds.
- **The QT SOUND CONTROL CURB** offers effective noise control in an easily-installed, self-flashing, prefabricated curb.

Leader in functional IMAGINEERING . . .

Four sizes. Overall height is 10" or 11" mounted like a conventional curb with or without cant strip. Can also be installed into roof for lower contour.

Patent Pending



JENN-AIR

JENN-AIR PRODUCTS COMPANY, INC. • 1102 Stadium Drive • INDIANAPOLIS 7, INDIANA

For more facts circle 514 on Reply Card

BULLETINS just released and of immediate plant interest

MATERIALS HANDLING

101 Industrial Trucks—Illustrated and described in this 8-pp product bulletin are powered materials handling trucks equipped with pneumatic tires for outdoor handling, as well as solid tire trucks for indoor applications. Capacity-load tables included. Clark Equipment Co.

102 Double Purpose Truck—Cost-cutting versatility of company's Trackmobile—one minute a truck running on rubber tires on the road, the next rolling across a railroad track as a freight handler—is described in 32-pp Bulletin T-131. Pictures show how it switches, spots, and hauls railroad cars, among other duties. Whiting Corp.

103 Overhead Handling—Detailed information on company's line of jib cranes and crane bridges is presented in 20-pp Bulletin 15005-5A-59. Design features are described and data on capacities (½ through 50 tons), specifications and outline dimensions included. Many of the crane bridges come in "build it yourself" kits. Manning, Maxwell & Moore, Inc.

104 Portable Electric Hoists—Eight-pp Bulletin 15010-15C-59 describes push button or pull cord control portable electric hoists. Cutaway views showing component features are included, as well as complete specifications and price information. Manning, Maxwell & Moore, Inc.

105 Wire Rope Data—Condensed Bulletin 6025 lists up-to-date weights and strengths of both improved plow steel and extra improved plow steel. Also describes wire rope constructions and types and includes information on ordering wire rope. Macwhyte Wire Rope Co.

106 New Twists in Tubes—Case histories of recent advances in pneumatic bulk handling are given in 8-pp Fact File ER-G-6. These concern installations for unloading wood flour from railway cars and moving it through storage and in process, and for transfer of alumina from rolling stock to seagoing vessels. Other installations describe handling of bread flour, mixed feed, cement, sugar, asbestos fiber. Fuller Co.

SAFETY

107 Fluorescent Safety Paint—Advantages of high-visibility fluorescent safety paint are detailed in Bulletin 2236. Through the use of a diagonal flap, the interior of a typical industrial plant is bisected to show applications of safety paint on crane hooks, a fork lift truck, critical switches, fire extinguisher, railings, signs, others. Switzer Brothers, Inc.

108 Self-Sticking Identification—Products to aid in planning and executing industrial maintenance and safety identification programs are illustrated and described in 32-pp Catalog 520. Among items covered are piping marking systems, identification of plant wiring and electrical equipment, lubrication marking, safety marking for hazardous locations. W. H. Brady Co.

PUMPS, COMPRESSORS

109 Controlled Volume Pumps—Bulletin 1158 describes company's diaphragm slurry pump for controlled volume pumping of hard-to-handle slurries and solutions. Operation details are shown through cutaway diagrams, and specifications and applications data included. Milton Roy Co.

110 Metering Pumps—Illustrated and described in 28-pp Catalog 59 are pumps designed to solve pumping problems where hard-to-handle chemicals or accurate metering are involved. Includes information on types of difficult fluids which the pump can handle, operation details (with drawings), and various types of reagent head available, data on auto-pneumatic and electronic controls, capacity tables and specifications. Process Equipment Div., Lapp Insulator Co., Inc.

111 Pumps and Controls—Bulletin 220 contains 72-pp of data on design details and operating characteristics of hydraulic pumps, fluid motors and valves. Special sections are devoted to various types of hydraulic pumps, pumping units, fluid motors, and control valves, covering design and operating characteristics of components involved, with cutaway illustrations and tables of performance data. Denison Engineering Div., American Brake Shoe Co.

112 Stationary Compressor—Bulletin A-72, 24-pp, describes company's WN-114 stationary air compressor offering simplified installation through package design. Includes specifications on three basic models of the semi-radially constructed units ranging from 1385 to 1948 cfm at 125 psi. Design components, intercooling, lubrication, motor mountings and accessories are illustrated and explained. Joy Mfg. Co.

113 Engine-Driven Compressors—Six-pp Bulletin 179 describes design features and advantages of company's turbocharged gas-engine-driven compressors. Cutaway view showing construction details is included, and detailed dimensional data and specifications. Clark Bros. Co.

INSTRUMENTS, CONTROLS

115 Automatic Controls—Comprehensive data on mercury switch equipped controls for single stage pressure, two-stage pressure, differential pressure, single-stage temperature, two-stage temperature, liquid level and mechanical movement are presented in 56-pp Catalog 860. Each control with accompanying description, specifications and engineering data is indexed by product name and type number. The Mercoid Corp.

116 Industrial Thermometers—Bulletin F-2 illustrates and describes industrial thermometers in air duct and moisture-proof models, and an easily positioned model that adjusts and locks in any required form or angle to by-pass piping for better visibility. Precision Thermometer & Instrument Co.

117 Rotameters, Flow Indicators—Condensed Bulletin M-1 features precision instruments for measuring, indicating, recording and controlling rate of flow of all types of fluids. Various types of rotameters are illustrated and described, as well as flow indicators for installation in pipe lines where it is necessary to determine, by visual observation, that fluid is flowing in right direction and state. Schutte and Koerting Co.

118 Rotameter Selector—Bulletin 110 illustrates and describes a complete line of rotameters and accessories for flow instrumentation. Details advantages of variable area flow meters in their specific applications. Brooks Rotameter Co.

119 Instrument Components—The pocket-size, 416-pp 1960 Master Catalog 21 contains technical details, specifications and drawings of more than 12,000 of this manufacturer's stock instrument components. They include precision gears, shafts, speed reducers, magnetic clutches, differentials, instrument plates, tool parts, others. Also provides data on breadboard kits. PIC Design Corp.

Reader Service Cards for ordering bulletins are on pages 271-272. Be sure to include your name, job title, and company, even if you want bulletins mailed to your home address.

120 Positioning, Program Controls—Bulletin J-105, 16-pp, features an expanded line of linear and rotary actuators; six basic types of remote positioners; machine tool point-to-point position and rate control; punch card formula and program control; closed loop process control. Provides descriptive and application information, sizes. Jordan Controls, Inc.

121 Process Controller Uses—This 24-pp application data book details use of transistorized digital preset counters, process controllers, and rotopulsers and other sensing devices for providing precise numerical readout and actuation of automatic control functions. Data sheets describe basic operation, sensing, indicating and control functions in each application. Dynapar Corp.

BULLETINS

(Begins on page 23)

122 Speed Recorder—Bulletin GET-2741-3A discusses application, features, principles of operation and specifications of company's multi-range strip-chart speed recorders. Material-processing applications related to the paper, steel, textile, rubber, and other industries are described, and application diagrams are included. General Electric Co.

123 Mineral Insulated Thermocouples—Features and advantages of mineral insulated thermocouples are detailed in 20-pp Catalog 300. Includes detailed specifications for ordering complete assemblies, as well as data on hot junctions, terminations and mounting methods, all of the products correlated into company's ordering number system. Conax Corp.

124 Thermocouple Wells—Detailed selection data on thermocouple wells and assemblies for a variety of applications are presented in 18-pp Catalog G102-1. It includes such information as well as designs and dimensions, pressure and temperature rating, corrosion data, thermocouple assembly data, and ordering and pricing information. Minneapolis-Honeywell Regulator Co.

125 Leak Detector—Six-pp Bulletin GET-2936 gives detailed instructions on use of halogen leak detectors for finding leaks in enclosures that can be pressurized, in such applications as steam boilers, valves, piping, transformers, air-conditioning and refrigeration equipment, and others. Includes discussion of system preparation, testing procedures, quantitative measurement techniques. General Electric Co.

126 Water Treatment Control—Methods for automatic control of water treatment plants are discussed in 8-pp Technical Reprint T-179. In two parts, Part I deals with control of demineralization plants and covers a wide range of subjects including "stepless" regeneration, quality control of effluent, conductivity pH control, automatic regeneration. Part II considers control of cold process softening and clarification units, hot process-hot zeolite systems and sodium zeolite systems. Graver Mfg. Co.

127 For Teaching Servosystems—A new method of teaching servo systems that bridges the gap between theory and practice is described in 8-pp Special Report SR-3. Explains how packaged assembly of electronic and electrochemical components permits students to build and test servo systems. Servo Corp. of America.

WASTE HANDLING

128 Industrial Waste Treatment—Bulletin B-97-2, 24-pp, is a compilation of articles on instrumentation for treatment of industrial wastes. Illustrates and describes case histories of how instruments are applied to industrial waste treatment systems to prevent stream pollution. Minneapolis-Honeywell Regulator Co.

129 On Incinerators—Charts and cross-reference tables for selection of incinerators to handle a variety of different materials are presented in 8-pp Bulletin 184. Design factors are detailed and a page is devoted to suggested wording for incinerator specifications. Morse Boulger, Inc.

MECHANICAL POWER TRANSMISSION

131 Power Transmission Equipment—Design and construction data on power transmission equipment, including variable speed pulleys, V-belts, sheaves, motor bases, countershafts, and transmission drives are presented in 32-pp Catalog P-58. Includes ratings and dimensions, mounting diagrams, sketch of typical arrangement, representative uses. Lovejoy Flexible Coupling Co.

132 Belt Drives—Precision constructed belts with gear-like teeth which engage mating grooves in pulleys are featured in 58-pp Catalog GB-201-A. In addition to specifications on Gearbelts and pulleys, catalog contains design and installation suggestions, engineering data and examples, combinations already worked out for convenient selection. Browning Mfg. Co.

133 V-Belt Drives—Illustrated and described in 36-pp Bulletin 9102 is a line of V-belt drives designed to utilize advantages of synthetic fibers and rubbers and high strength metals to achieve compactness, strength and economy. Includes drive selection tables, horsepower tables, nomograms for comparison of drive costs, sheave and belt specifications, other specifications. T. B. Wood's Sons Co.

134 Chain and Sprockets—Roller chain and sprockets designed to meet nearly all roller chain requirements are illustrated and described in 56-pp Bulletin A691. Covering single strand, double strand, single strand heavy, double pitch drive, double pitch conveyor, double pitch conveyor with large rollers, and standard attachments, bulletin contains photos and diagrams showing construction details, selection data, installation information, calculation of center distances, horsepower ratings, lubrication data. Dodge Mfg. Corp.

135 Rugged Roller Chain—This technical folder describes offset side bar roller chain designed for applications where operating conditions are severe. Full details on the chain are given as well as drawings of its construction, tables of sizes available and sprockets. Atlas Chain & Mfg. Co.

136 Magnetic Pulleys—Features and advantages of company's magnetic pulleys for removing tramp iron and small iron contamination, preventing machinery damage, fire and explosions are detailed in this product bulletin. A general guide to pulley selection covers types of tramp iron, principle of pulley operation, capacities, dimensions. Eriez Mfg. Co.

137 Spherical Roller Bearings—Features and advantages of company's spherical roller bearings with super-finished raceways and rollers for smoother operation are detailed in 16-pp Bulletin 113. Tables of bearing dimensions and load ratings included. Hoover Ball and Bearing Co.

138 Pillow Blocks—Features and advantages of company's tapered roller bearing pillow blocks with unbreakable malleable housings are detailed in Bulletin Bu-102-A. Includes specifications and list prices, comparison chart for interchange with other makes. Browning Mfg. Co.

VENTILATION

139 Plastic Ventilating Equipment—Illustrated and described in 18-pp Bulletin B-500 are plastic ventilation products, including ventilating ducts, fittings, exhaust hoods, stacks, covers, fans, and fume scrubbers. Physical and chemical properties of glass-reinforced plastics are detailed. Heil Process Equipment Corp.

On pages 271-272 are two postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

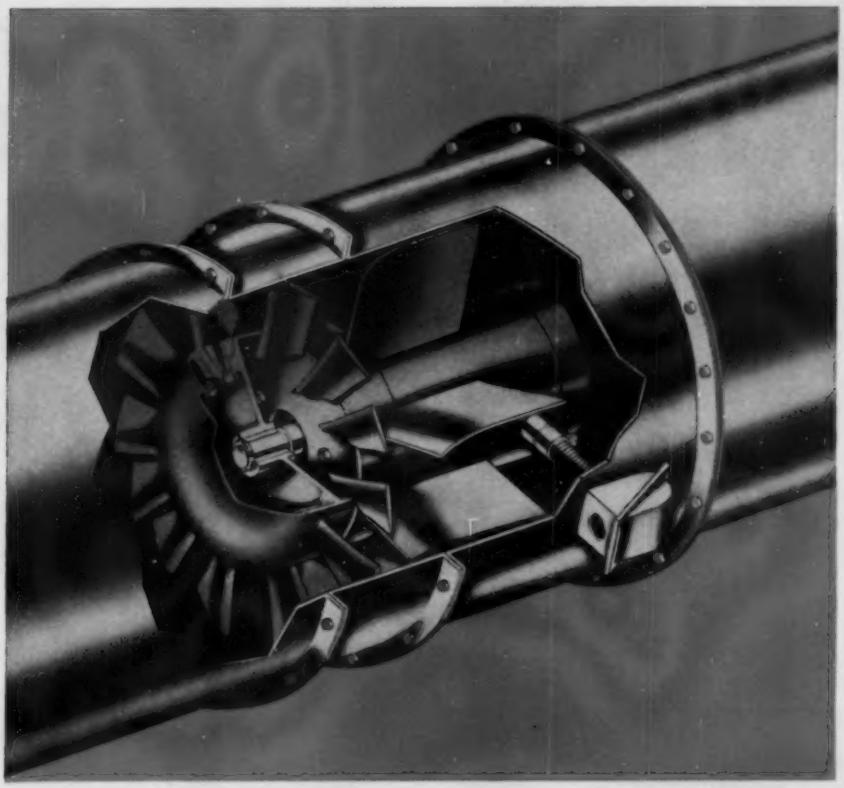
140 For Efficient Ventilation—Described in Bulletin CRV-1 are continuous ridge and round gravity ventilators. Dimensional, capacity and application data are presented. Covers continuous ventilators in sizes through 96 in. for high heat applications, and in smaller sizes with low contour design. Round gravity units are shown in three types for heavy industrial use. Bowman Steel Corp.

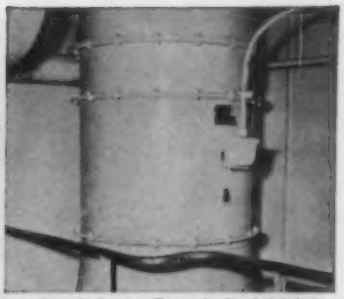
PIPING AND VALVES

141 Ductile Iron Pipe—Properties and characteristics of ductile iron pipe, which combines the mechanical strength of steel with the corrosion resistance of cast iron, are detailed in this 20-pp bulletin. Tables list physical and metallurgical properties of ductile iron pipe, compare its corrosion resistance in various media. James C. Clow & Sons, Inc.

142 Single Control Valve—Design and operating features of a single control valve for zeolite softeners, ion exchange units and filters are illustrated and described in Bulletin WC-122. Covers construction details of cast iron and all-plastic unit, includes schematic drawings of flow, and guide to valve selection. Graver Water Conditioning Co.

(More Bulletins on page 273)





Joy Axivane Fans bolt right into the ductwork. This saves space and simplifies installation.

Joy Design Means:

COMPACTNESS AND SIMPLIFIED INSTALLATION

Joy Axivane® Fans are compact and easy to install because of the integral motor design. They can be bolted right into the duct, and will maintain the straight-through flow of the air. By eliminating the offsets and elbows necessary with conventional fans, Joy Axivane Fans improve over-all system efficiency. Installation costs are reduced, because the fans can be put in place as the duct is being fabricated, and there are no motor supports to construct.

The basic vaneaxial design of Joy fans makes them highly efficient, particularly where large volumes or high pressures are involved. All Joy Axivane Fans have adjustable blades. By changing blade pitch, fan output can be varied as much as ± 20% without the loss of fan efficiency typical of dampers or variable inlet vane controls. When the system is difficult to calculate, or varies from time to time, this feature can save you a great deal of time and money.

For complete information on how Joy Axivane Fans can solve your ventilating problems, write for Bulletin 1213-15.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

For more facts circle 515 on Reply Card

but only the Westinghouse Lamp has six

Despite similar appearance and ratings, these fluorescent lamps are *not* the same. One is a better lamp—and a better buy—because it's the only fluorescent lamp with all 6 advances described below. That lamp is made by Westinghouse. It costs you no more than any other leading brand—but it will give you years of trouble-free, efficient lighting.

1. **MORE EFFICIENT PHOSPHORS**—A special Westinghouse process selects Ultralume™ phosphor particles of a size proven to give more efficient lighting.

2. **BRIGHTER END TO END**—Lead wires are plated with super-hard Chrome Vanadium to make sure Westinghouse tubes *stay* bright, end to end.

3. **BUILT-IN "SHOCK ABSORBERS"**—Specially designed Westinghouse anodes act as buffers to cushion the terrific shock of electron bombardment and improve lamp life.

4. **"RAINCOATS" FOR RELIABLE STARTING**—Silicone "raincoats"

important advances that make it a better buy!

disperse moisture which can collect on exterior surfaces and prevent lamps from starting.

5. MIXED GASES—Westinghouse uses a precise mixture of certain rare gases, under exact pressure, to improve the light output.

6. TRIPLE-COILED ELECTRODES—To protect electrodes from the sudden electron bombardment when the lamp is first turned on. Emission material is quickly heated, fully protected.

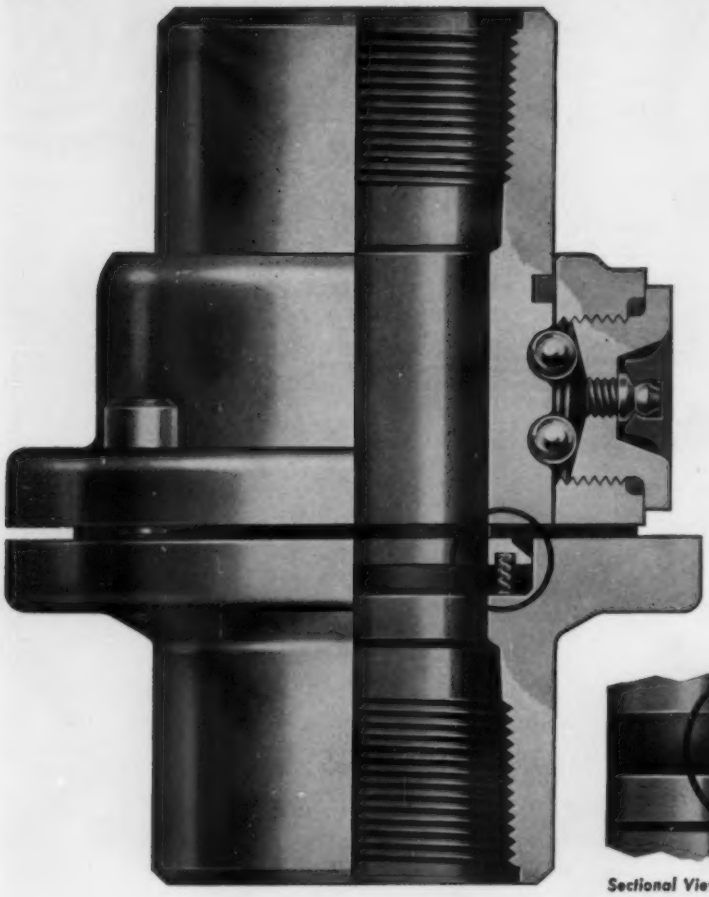
Regardless of the type or wattage of fluorescent lamps you buy, you will get better value, more light for your money, and longer, trouble-free service if you specify and insist on Westinghouse fluorescent lamps. Westinghouse makes a complete line, from tiny 4-watt lamps for instrument lighting to the giant 96-inch Super-Hi™ Lamps for store, street, and factory lighting. Contact your authorized Westinghouse lamp agent or nearest Westinghouse sales office.

YOU CAN BE SURE... IF IT'S Westinghouse

WESTINGHOUSE LAMP DIVISION, Westinghouse Electric Corporation, Bloomfield, N. J.

For more facts circle 516 on Reply Card

For Trouble-Free Flexibility on Steam, Hot Gas, Chemical Service Lines



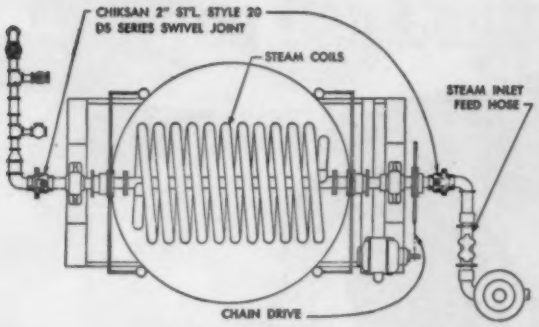
For the engineer concerned with flex or rotational problems, on lines handling steam, hot gas or chemicals, the new DS swivel joints present a quick, effective solution. Versatile packing design permits use of either disc or molded types of packing to meet a wide number of services. Split segments allow replacement of packings within minutes and without removing joint from the line. And within the eight basic configurations of the new DS series joint are models to provide full 360° rotation in one, two or three planes. DS series swivel joints are recommended for chemical services ranging from –40° to +400°F and 300 psi. In steam rotation, the maximum is 440°F at 360 psi. For complete details on this remarkable series of Chiksan swivel joints, write today for your copy of Bulletin 1258.

Sectional View showing typical molded packing installed

NEW *CHIKSAN* DS

REPLACE SEALS WITH SWIVEL JOINT IN LINE

Allen-type screws secure the two sections of the DS series swivel joint. Screws are readily removed and seals replaced with joint in the line.

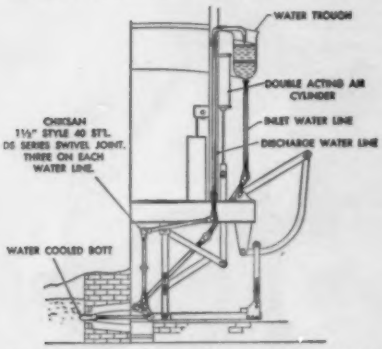


ROTATING STEAM COIL IMPROVES COOKING QUALITY, CUTS COSTS

For more details, request application report .009

Stationary steam coils in a large food processing plant were accumulating burned scale, reducing heat transfer by as much as 20% in a relatively short time.

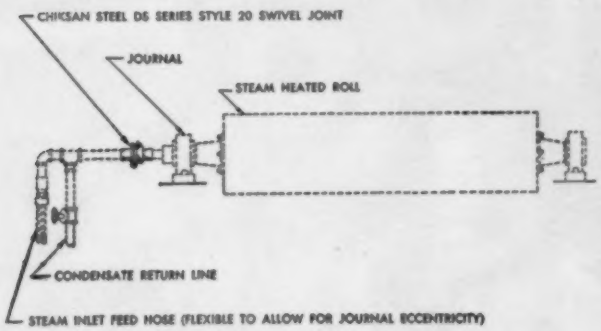
Using Chiksan DS series swivel joints, the plant engineer designed a self-scouring rotating coil. Net results, this plant now gets closer flavor and quality control—also sustains heat-exchange efficiency—thus saving fuel.


WATER TROUGH
DOUBLE ACTING AIR CYLINDER
INLET WATER LINE
DISCHARGE WATER LINE
CHIKSAN 1½" STYLE 40 ST'L. DS SERIES SWIVEL JOINT. THREE ON EACH WATER LINE.
WATER COOLED BOTT

SWIVEL JOINTS HELP PULL THE PLUG ON MOLTEN SLAG

For more details, request application report .014

Pulling the water cooled bott permits removal of molten slag from blast furnaces. Proximity to the intense heat made rubber hoses out of the question. And even ordinary swivel joints weren't faring too well because packings would bake out in a day or two. New Chiksan DS series swivel joints deliver the solution, providing ten to twelve weeks of service before packing replacement is required.


CHIKSAN STEEL DS SERIES STYLE 20 SWIVEL JOINT
JOURNAL
STEAM HEATED ROLL
CONDENSATE RETURN LINE
STEAM INLET FEED HOSE (FLEXIBLE TO ALLOW FOR JOURNAL ECCENTRICITY)

STEAM STAYS ON THE BEAM WITH CHIKSAN SWIVEL JOINTS

For more details, request application report .004

To emboss plastic sheets, the material must be heated to a just-right degree of softness. A steam leak at the swivel joint connecting the stationary steam pipe to the revolving inlet means serious trouble. Previous tried devices were unsatisfactory. A DS series swivel joint was recommended. Present joint has been in service for better than four months with superior results. And when packing fatigue does occur, it can be quickly replaced with a minimum down time.

SWIVEL JOINTS
SERIES

CHIKSAN COMPANY, 330 North Pomona Avenue, Brea, California
Please send me copy of Bulletin 1258.
Please send me product application report .004 ☐ .009 ☐ .014 ☐

Name_____

Company_____ Title_____

Address_____

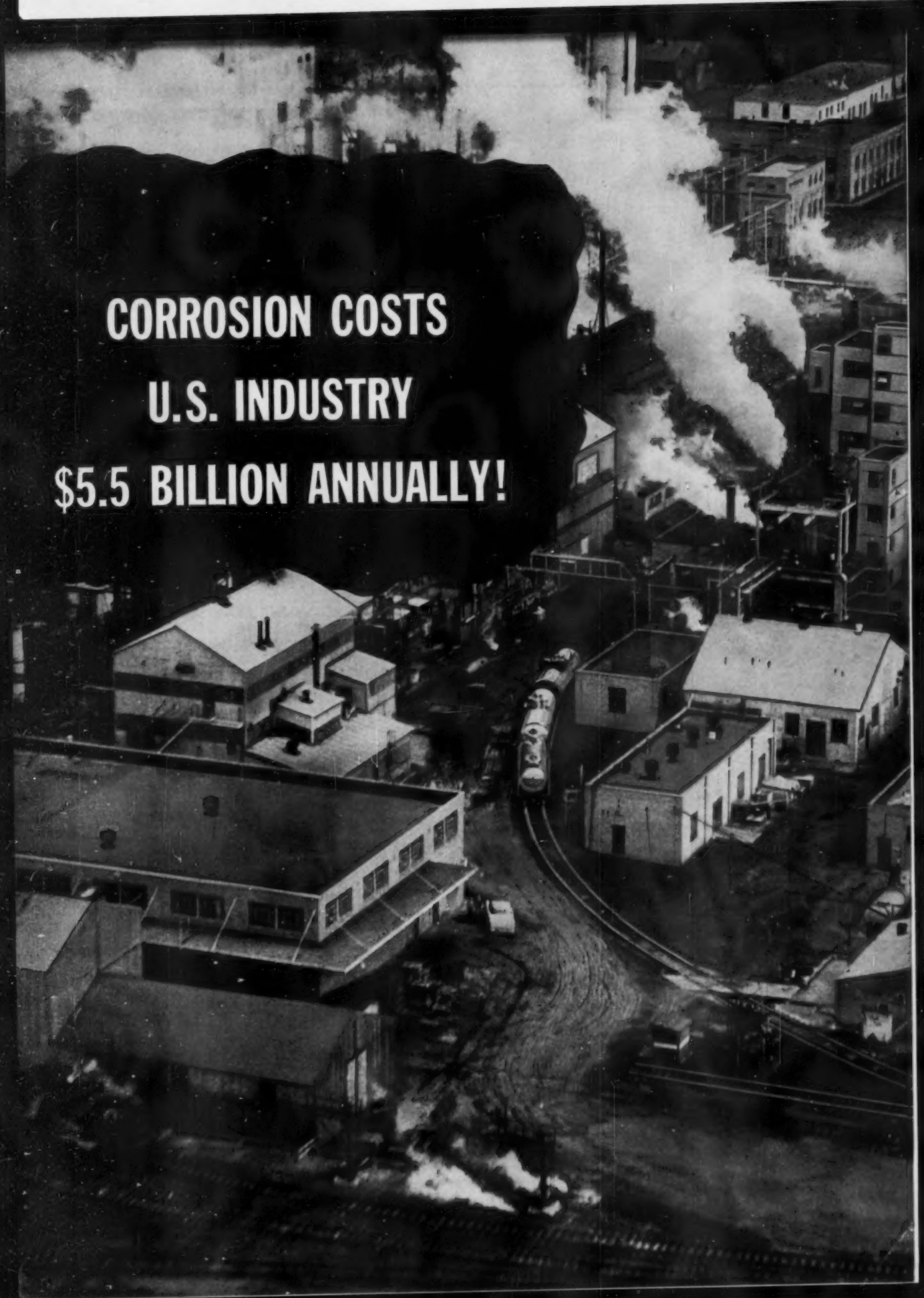
City_____ Zone_____ State_____

CHIKSAN fmc

A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

CHIKSAN COMPANY—Brea, Calif. • Chicago 5, Ill. • Newark 2, N. J. • Waco (Division), Houston 1, Texas • Subsidiaries: Chiksan Export Co. • Chiksan of Canada Ltd.

For more facts circle 517 on Reply Card


CORROSION COSTS
U.S. INDUSTRY
$5.5 BILLION ANNUALLY!

Now You Can Control 97% of All Your Corrosion Problems with this Proven PITT CHEM® Coating System!

Corrosion is one of the biggest profit robbers in American industry today. It is conservatively estimated that corrosion costs U.S. industry $5.5 billion annually . . . or $9,468 per minute! How much is this enormous waste costing *your* plant?

More and more corrosion engineers are turning to the *complete* PITT CHEM System of thick-film, cold-applied coatings for efficient long-lasting protection against corrosion. The PITT CHEM system is composed of over 20 different coatings, each formulated to control a specific type of industrial corrosion—from the most ordinary to the most severe—at minimum cost.

PITT CHEM Tarset, Tarmastic and Insul-Mastic are tough, *heavy film* coatings that outlast conventional maintenance paints 10 to 20 times. You measure their protection in *decades*, not years. They can be cold-applied by brush, spray gun or roller. No other family of protective coatings can solve so *many* of your corrosion problems so *economically*.

For more information, mail the coupon below. Then consult your nearest PITT CHEM Distributor—he's listed in the "Yellow Pages." Or call Pittsburgh Coke & Chemical Company in Pittsburgh, New York, Chicago, Houston or Los Angeles. A PITT CHEM Corrosion Engineer will be glad to discuss your corrosion problems without obligation.

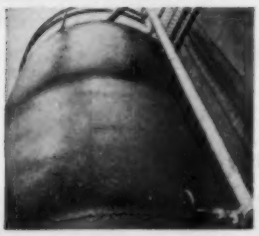
PITT CHEM TARSET®

The original, patented coal tar-epoxy coating, Tarset is being used throughout industry to solve corrosion problems that were once considered "impossible." This revolutionary cold-applied coating is ideal for the protection of underground storage tanks, pickling tanks, high temperature steam lines, waste tanks and similar equipment.

PITT CHEM TARMASTIC®

PITT CHEM Tarmastic coatings are a series of coal tar protective coatings designed to meet a wide variety of corrosive conditions at moderate cost. Their protective ability has been proven by years of service on concrete, stone and masonry surfaces, cooling towers, fan housings, tank exteriors, potable water systems and similar equipment.

PITT CHEM INSUL-MASTIC®



A series of high quality Gilsonite-asphalt mastics recommended for economical, long-lasting protection against moisture and atmospheric corrosion. Widely used as a weather and moisture barrier over metal buildings and equipment. Insul-Mastic insulating cork mastics provide good heat loss reduction and condensation control.

PITT CHEM PIPELINE ENAMELS

PITT CHEM Coal Tar Pipeline Enamels protect oil and gas transmission and distribution lines throughout the United States. These proven, high quality enamels are geared to meet a wide variety of underground service conditions and are backed by experienced technical field service.

Send for Your Free Copy of this

INDUSTRY CORROSION DATA FILE

Includes a survey of corrosion problems in general industry, data on PITT CHEM Coating Systems and a coating selector guide.

Name_____ Title_____

Company_____

Street_____

City_____ State_____

1180

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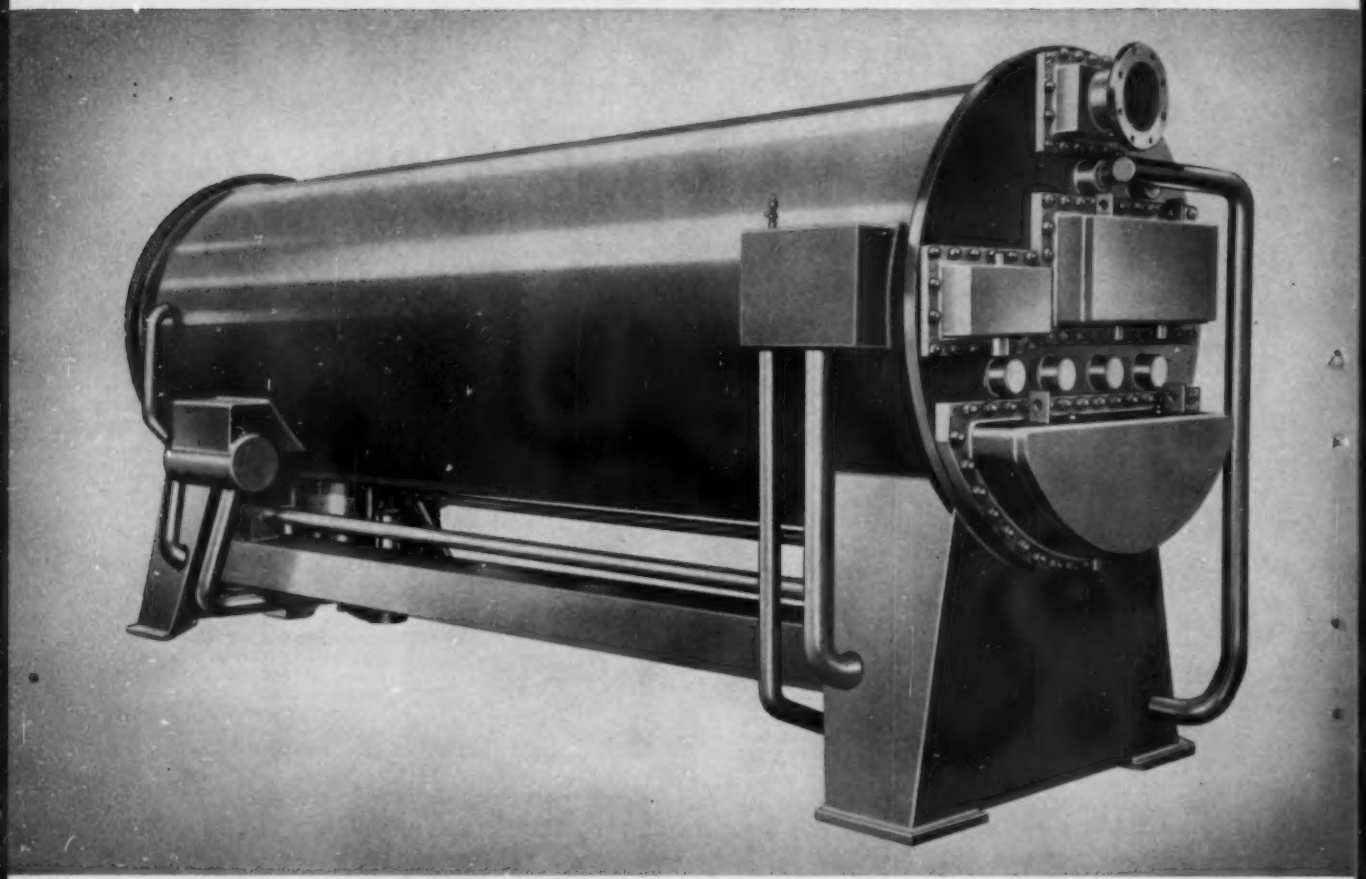
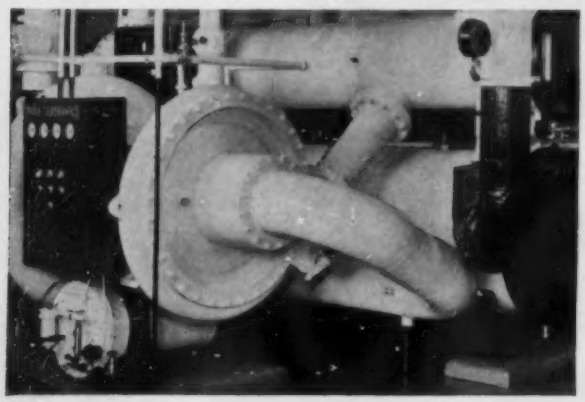
Now! Low-cost industrial Trane Hermetic



For industrial process cooling or comfort air conditioning—wherever there is a supply of low-cost steam—the new TRANE Absorption Cold Generator is available in nine sizes, 100 to 350 tons . . . making it easy to select a unit to match the exact requirements; means fuel savings and efficient part load operation.

There's Trane matched equipment for every air conditioning need...



Hermetic CenTraVac water chiller with electric drive modulates to 10% of capacity, or lower, with power savings in almost direct proportion to load. Compact, with low silhouette design. Open type compressor models for any type of drive and steam turbine CenTraVacs are available.

New Reciprocating Cold Generator now hermetic—with TRANE built chiller and condenser. Provides efficient water chilling for a wide variety of applications. Factory-wired control panels mounted on unit to eliminate on-the-job wiring. Features new TRANE Hermetic Reciprocating Compressor.

water chilling...with a Absorption Cold Generator

Advanced hermetic design, single-shell construction provide simplified installation, minimum maintenance, economical operation for process or comfort cooling

Here's a compact packaged hermetic absorption water chiller—the TRANE Absorption Cold Generator. It's designed to provide a dependable, economical source of chilled water for process or comfort cooling in industrial plants, hotels, apartments and office buildings—wherever there is a supply of steam or hot water.

The advanced *hermetic* design assures reliable operation under all operating conditions . . . prevents air from entering the system which causes crystallization, deterioration and maintenance problems. The machine operates under conditions which avoid crystallization. (If power failure or other temporarily abnormal conditions occur, the machine will tend to free itself of any resulting crystallization.)

Fully automatic operation means no full time attendant is needed. The unit responds immediately and automatically to changing load requirements. Its design provides maximum efficiency under full and partial load conditions—results in low power consumption, economical operation. And the new Absorption Cold Generator is *quiet*, vibration-free—may be located anywhere without sound-proofing the area. Single-shell construction reduces overall size, permits installation in areas with low ceilings. Factory-assembled and wired, it has been designed to effect substantial savings in installation time and costs. Nine sizes from 100 to 350 tons permit selection of a unit to match the exact cooling requirements.

The TRANE Company has extensively tested and proven this new *hermetic* absorption water chiller design assuring dependable, economical water or other liquid chilling for a wide variety of applications; and it will minimize operation and maintenance problems.

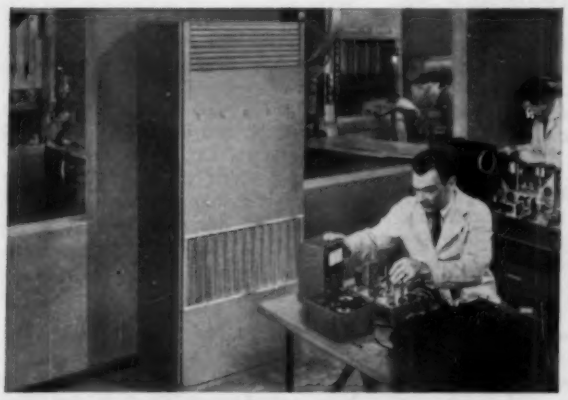
WANT MORE FACTS? For complete information on the new TRANE Hermetic Absorption Cold Generator, just call your nearby TRANE Sales Office; or write TRANE, La Crosse, Wisconsin.

For any air condition, turn to

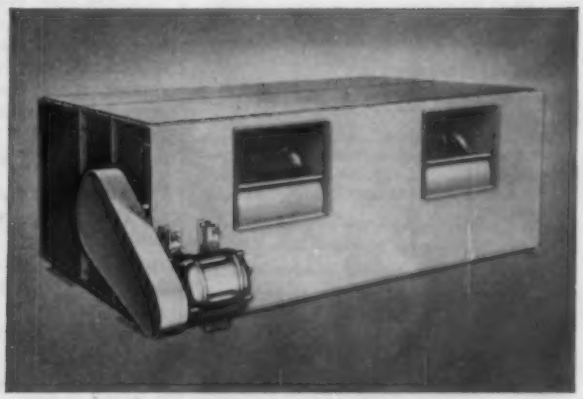
TRANE

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS. • SCRANTON MFG. DIV., SCRANTON, PA. • CLARKSVILLE MFG. DIV., CLARKSVILLE, TENN. • TRANE COMPANY OF CANADA, LIMITED, TORONTO • 100 U.S. AND 19 CANADIAN OFFICES



New Heat Pump is compact, efficient, designed for in-the-room or remote installation. 3 to 15-ton capacities for industrial or commercial applications. Easily accessible piping and connections simplify installation. Compact water to air unit takes little floor space. Refrigeration cycle removable.



New Climate Changers heat, cool, ventilate . . . solve a wide variety of application problems. Single-zone and multi-zone units that supply different air conditions for as many as 14 zones at the same time. New design features reduce overall costs. 1200 to 47,000 cfm.

CHEMPRO SQUARE-BRAIDED TEFLON* PACKINGS

Chempro Square-Braided Teflon Packings are tough, strong and chemically inert. They outlast ordinary braided packing many times over, holding together longer against even the strongest acid, alkali or organic solvent. Here are four popular Chempro Square-Braided Teflon packings:

STYLE No. 400 PACKING
Constructed of pure Chempro tape, braided square without lubrication. For highly corrosive services where a lubricant is undesirable.

STYLE No. 400-F PACKING
Resilient, square-braided packing of Chempro Teflon multi-filament yarn, without lubrication. For pump and valve applications in highly corrosive services where the packing must "give" to a certain extent.

STYLE No. 400-FI PACKING
Square-braided packing of Chempro Teflon multi-filament yarn and impregnated with Teflon suspensoid. This dense packing was developed for gas and vapor services where other lubricated packings were not acceptable.

STYLE No. 400-FL PACKING
Made by square braiding Chempro Teflon multi-filament yarn and externally lubricating with a non-hardening and non-melting lubricant. Recommended for high speed applications and highly corrosive services, from freezing to 350° F.

These Chempro Braided Teflon packings are available in all sizes in standard 1/16" increments from 1/8" to 3/4" square—in spool or coil forms. Can be cut to specific ring sizes, if desired.

Write for revised Bulletin CP-552.

*duPont trademark

CHEMICAL & POWER PRODUCTS, Inc.

7 Broadway, New York 4, N. Y.

For more facts circle 520 on Reply Card

BACKTALK AND FORETHOUGHTS

Edited by Marjorie E. Weissman

Plastics for Construction

PLANT ENGINEERING:

"I represent a group of nine, second-year students at the Harvard Graduate School of Business Administration who are writing a report on the present and future use of plastics as a building construction material.

"We would appreciate your providing us with any or all of the following kinds of information with which you may be familiar: Details of recent or planned new uses of existing plastics for building construction; information concerning the development of new plastics which may have applications in the construction field sometime in the future; and suggestions concerning other sources which might be able and willing to provide us with additional information." *John A. Shane, Harvard Business School, Boston, Mass.*

► Glad to oblige with tear sheets of articles we have published on construction uses of plastics and with sources which we believe would be helpful. These include "Source Book of the New Plastics," compiled by Herbert R. Simonds and published by Reinhold; Society of Plastics Engineers; Society of the Plastics Industry; and the Building Research Institute, in Washington, D. C.—*Editors.*

Glad To Hear It

PLANT ENGINEERING:

"Will you kindly reserve for us a copy of your 'Construction Cost Estimating' now appearing in PLANT ENGINEERING.

"I will take this opportunity to tell you that, in our opinion, your magazine offers the plant engineer the kind of information which he needs to keep abreast of the times and it is written in such a manner as to be enjoyable reading as well." *Harry Griffin, Griffin Associates, River Edge, N. J.*

PLANT ENGINEERING:

"You have recently placed my name on your distribution list for your PLANT ENGINEERING magazine. I find it tremendously helpful in many areas.

"I would appreciate your sending me a copy of each one of your Construction Cost Estimating series. I find this information very useful in developing cost analysis of the various industrial building propositions that my work involves." *Wilho Salo, Vice President, The Ferber Co., Hackensack, N. J.*

► Many of our readers are finding this series extremely useful and interesting. After its completion in May of this year, reprints of the complete series will be available.—*Editors.*

Fire-Resistant Lubricants In Compressed Air Systems

PLANT ENGINEERING:

"I read with considerable interest, Mr. John G. Howell's excellent article in the September, 1959 issue of PLANT ENGINEERING. While I may have a small axe to grind, I thought Mr. Howell might be interested in some experiences we have had in compressed air systems not too much different from the ones he describes.

"My job as plant engineer for the Celanese plant producing, among other items, a fire-resistant air compressor lubricant, makes me acutely conscious of the hazards of air header fires due to oil carry-over. Experience . . . . . indicates that the additional cost per gallon of Cellulube fire-resistant lubricants does not necessarily mean higher total costs of lubricating air compressors. For example, lubricant feed rates as low as 20 per cent and even 10 per cent of those recommended by compressor manufacturers have been successfully used. When the cost per gallon is only five to six times that of good mineral oils, the fire-resistant feature becomes a free bonus.

"In Mr. Howell's particular application, where insulated air headers would make a fire more serious, I certainly feel use of a product of this type would pay off.

"A tip in case anyone tries some: In normal lubricators, where the oil floats up through a clear liquid so a visual check can be made of lubricator operation, Cellulubes are heavier than the water normally used. We use glycerine solution of heavier gravity than the lubricant with good results." *P. A. Penley, Plant Engineer, Celanese Chemical Co., Gallipolis Ferry, West Virginia.*

► We forwarded Mr. Penley's letter to Mr. Howell, author of "Vapor in Compressed Air—Make it Work for You, not Against You" in our September issue. Following is his reply:

"Cellulube is not unknown to us,

How to increase the life of your air tools and cylinders

...Norgren Lubro-Control Units reduce wear, improve equipment performance and cut maintenance costs.

To get maximum life from your air tools and other pneumatic devices, it is essential to filter the compressed air, control its pressure and to provide proper lubrication.

Filter removes abrasive solids and corrosive liquids

Compressed air as it comes directly from an air line generally carries with it dirt, pipe scale, rust and various liquids. If these substances are allowed to be carried by the air into your air tools, cylinders and other air-operated equipment, they will cause excessive wear and corrosion. The operating life of your air-devices will be cut short, and maintenance costs will be high. An air line filter must be used to remove these abrasive solids and corrosive liquids from the compressed air.

Regulator controls pressure

The fluctuating pressure of your compressed air system should be controlled by a pressure regulator. The regulator holds the pressure constant at the working pressure at which the pneumatic equipment will operate most efficiently.

Micro-Fog Lubrication ideal for air-equipment

Finally—and most important—pneumatic equipment must be given the right amount of lubrication. The best way to provide this lubrication is to put a lubricant into the air stream that powers the equipment.

A Micro-Fog Lubricator injects a fog of extremely fine particles of oil automatically and continuously into the air stream. It can be adjusted to meter just the right amount of oil for proper lubrication.

Micro-Fog particles are extremely fine. When injected into the air stream, they are like dry smoke until they reach the point to be lubricated. Because of this, Micro-Fog can be conveyed long distances and through complex piping systems without condensing into larger oil particles in the air line.

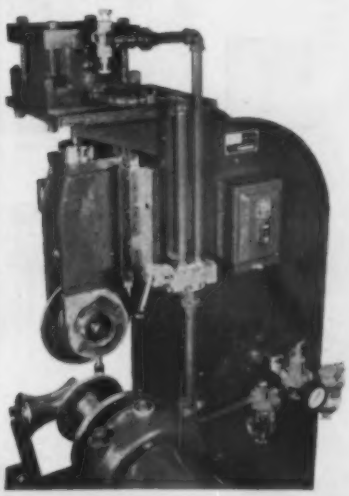
Norgren Lubro-Control Unit:

This unit consists of:

1. An air line filter.
2. A pressure regulator.
3. A Micro-Fog Lubricator.

It gives you these important benefits: better equipment performance, less wear, longer service life, less down time, lower maintenance costs.

For more facts circle 521 on Reply Card



The Norgren Lubro-Control Unit on this pipe cutting machine keeps the air cylinders operating at top efficiency. Without the Norgren unit, it was found virtually impossible to get the close control that is vital to the operation of the machine.

***FOR COMPLETE INFORMATION,* call your nearby Norgren Representative, listed in your telephone directory — or WRITE FOR DESCRIPTIVE LITERATURE.**

C. A. NORGREN CO.

Founded in 1926

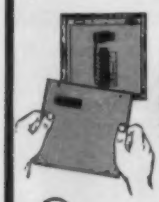
3443 SOUTH ELATI STREET
ENGLEWOOD, COLORADO

GTC

UNITIZED
COMMUNICATION EQUIPMENT for POWER and INDUSTRY

Effective! Reliable! Economical!

1 Highly effective in extremes of ambient noise and temperature.



2 Plug-in units provide ease of installation, expansion and maintenance.

3 Transistors and rugged, industrial type components used throughout.

4 Central control cabinet, costly engineering and fabrication eliminated.

Wherever a highly dependable, voice communication system for use in high noise level areas is needed—you'll find GAI-TRONICS specified by name.

GTC is extremely flexible in application. Write today for a copy of our completely illustrated, descriptive booklet and name of nearest representative.

GAI-TRONICS
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For more facts circle 522 on Reply Card

BACKTALK—FORETHOUGHTS

however, its comparatively high cost has been a deterrent to our actively pushing a test, particularly since the published literature on it states that 'Experience has shown that the feed rate when properly adjusted and stabilized will be approximately that of petroleum lubricants.'

"However, since you have indicated that feed rates as low as 20 per cent or even only 10 per cent of those recommended . . . . have been successfully used, the cost should no longer be a limiting factor. As a result, we have recommended that a test be made on a typical compressor to determine what is a practical feed rate for synthetic fire-resistant lubricants.

"As a check on our results, I would appreciate knowing the actual feed rates that you have been able to carry on each type and size of compressor." *John G. Howell, General Engineering Dept., Pacific Coast Div., Owens-Illinois Glass Corp. Oakland, Calif.*

Pneumatics-Hydraulics Series

PLANT ENGINEERING:

"Your October, 1959 issue of PLANT ENGINEERING has just crossed my desk and the article entitled 'How To Design Pneumatic-Hydraulic Systems' (both series please) which appears on pages 106 through 110, is of interest to me. Since the magazine circulates in our office to other engineers, I do not wish to mutilate it by tearing out pages. With this in mind, I would like to know if I could obtain a set of the tear sheets of this article." *E. R. Hottenstein, Mechanical Engineer, Nuclear Energy Div., Gilbert Associates, Inc., Engineers and Consultants, Reading, Pa.*

▶ Parts 1, 2 and 3 of this series have been forwarded to Mr. Hottenstein. Subsequent parts will be sent him after publication.—*Editors*

JIC Standards

PLANT ENGINEERING:

"We have read with interest the article on page 106 of the October, 1959 issue of PLANT ENGINEERING on the subject of pneumatic-hydraulic actuation systems.

"The footnote at the bottom of page 106 states that copies of complete JIC standards can be obtained from the American Standards Association, New York, by asking for Y32.10. We believe that this note is in error. Y32.10 is entitled, 'Graphical Symbols for Fluid Power Diagrams' and is not the complete JIC Standard.

"Copies of the JIC standards can be procured as shown on the attached list. For your information, we are enclosing a copy of the complete JIC standards." *J. Q. Holmes, Director of Production Eng., Technical Center, General Motors Corp., Detroit, Mich.*

▶ We appreciate Mr. Holmes' calling this error to our attention, and hope that our readers were not unduly inconvenienced. According to the list sent by Mr. Holmes, copies of the standards may be obtained as follows: JIC Electrical Standards from Gage Publishing Co., 205 42nd St., New York 17, N. Y.; JIC Hydraulic Standards from Applied Hydraulics & Pneumatics Magazine, 812 Huron Rd., Cleveland 15, Ohio; and JIC Pneumatic Standards from J. C. Rauss, Production Engineering Section, G. M. Technical Center, Box 128, Detroit 2, Mich.—*Editors.*

Plastic Pressure Parts Panes

PLANT ENGINEERING:

"On reading the November, 1959, issue of PLANT ENGINEERING, I was extremely interested to see the article on page 108 concerning plastic coatings for windows.

"Experience at our plant with this product was disastrous. Our building has Thermopane windows on a southern exposure for a portion of the first floor windows. The 'blue transparent plastic glass tint' was applied to three of our eighteen 6-ft by 10-ft windows in March, 1958. Within a year's time all three windows were cracked, due to thermal stresses set up on the glass. When an attempt was made to contact the contractor, it was learned that he was no longer in business.

"With the above facts in mind, you can understand why I wish to obtain detailed information on the product, its manufacture, details of application and individuals responsible for plant maintenance in plants where this has successfully solved the problem.

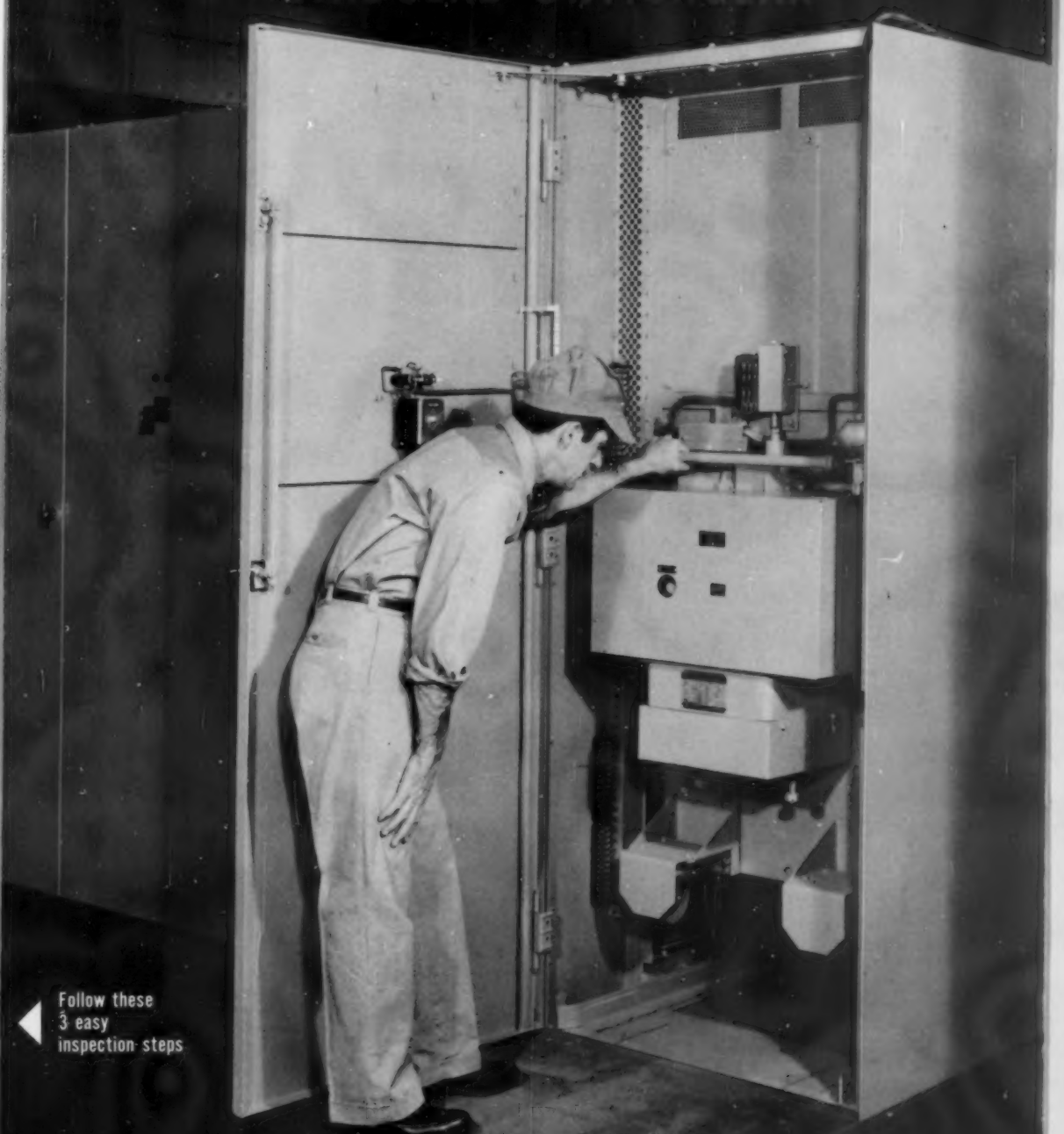
"Your assistance in this matter will be deeply appreciated." *John L. Evers, Building Superintendent, Continental Can Co., Chicago, Ill.*

▶ We have, of course, no way of knowing who the contractor was in this case, as there are undoubtedly many in the country. We hope that the additional information we are getting for Mr. Evers will be of assistance to him.—*Editors.*

For more facts circle 523 on Reply Card ——▶

Change hats
with your maintenance man, he will demonstrate...

WHY GENERAL ELECTRIC
MANUFACTURES ONLY *Vertical Lift*
METAL-CLAD SWITCHGEAR



Follow these
3 easy
inspection steps

GENERAL ELECTRIC

General Electric manufactures ONLY Vertical Lift Metal-clad because...

General Electric's exclusive *Vertical Lift* design gives you superior switchgear performance... these operational benefits

1 Visible circuit breaker safety protects your personnel — helps prevent wasteful outages

General Electric Vertical Lift is the only switchgear design which allows your operator to actually *see* when the primary disconnects are parted . . . a safety bonus that also reduces the possibility of costly equipment outages.

Safety you can see is a prime reason why General Electric manufactures Vertical-Lift design Metal-clad switchgear.

2 One minute contact inspection saves you costly maintenance time

General Electric Vertical Lift design lets your maintenance man expose the contacts in just one minute for cleaning, inspection, and adjustment. This efficient maintenance reduces your operating expense. Quick, easy contact servicing that contributes to the over-all economy of General Electric Metal-clad installations is another reason why General Electric manufactures Vertical Lift design switchgear.

3 Up-front location of operating mechanism cuts your installation, maintenance costs

G-E Vertical Lift design gives you another cost saving through placing the breaker operating mechanism and controls up front. Even the stored energy operating mechanism is mounted up front for easy access, reducing maintenance time and expense.

4 20-minute routine maintenance means less service man-hours — more productivity

Under normal conditions, your maintenance man can remove G-E Magne-blast breakers from their housing, give routine maintenance, and return them to service in 20 minutes. General Electric's exclusive Vertical Lift design contributes increased switchgear efficiency —in both operating and maintenance phases—to your Metal-clad switchgear installation.

5 Magne-blast circuit breaker action gives you effective system protection

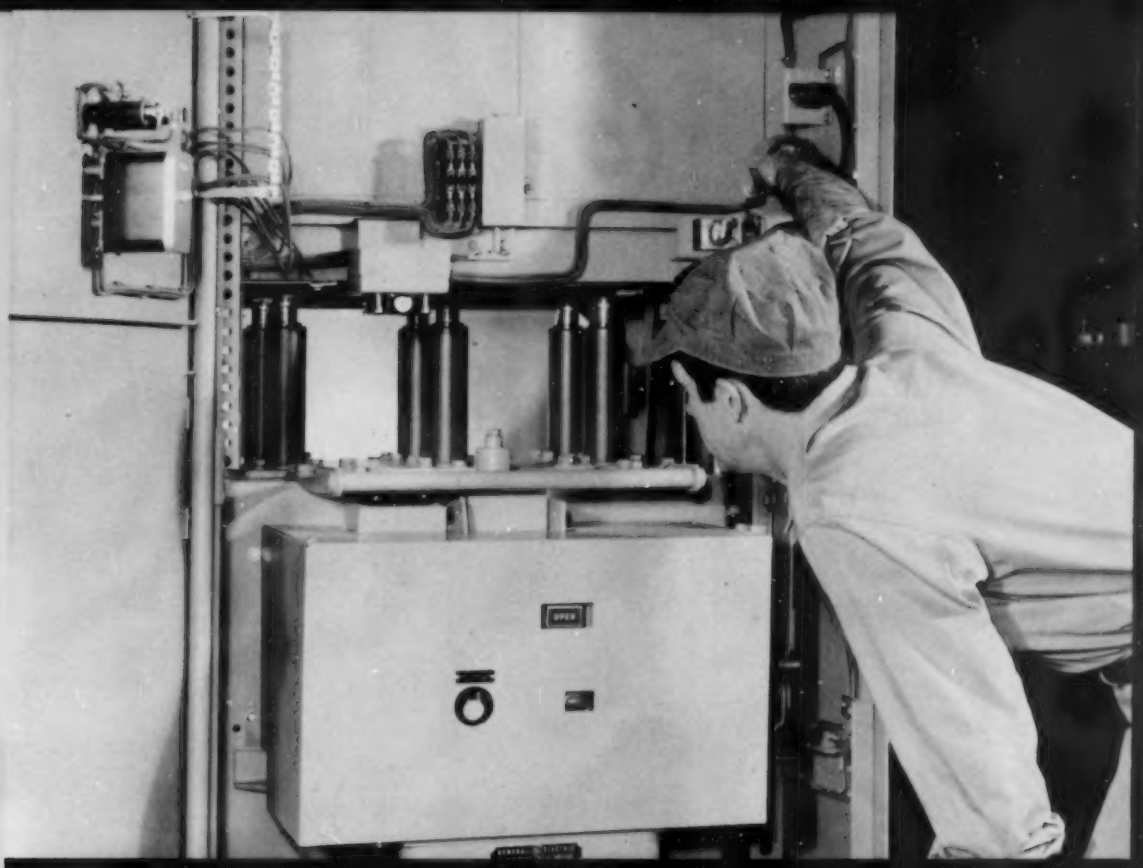
General Electric's Magne-blast breaker design gives you positive, three-phase interruption and fast, clean arc extinction — a combination that assures high reliability, top switchgear performance. Extensive factory quality control, and testing at full-rated interrupting capacity maintain the uniformly high operational standards of G-E Vertical Lift Metal-clad switchgear.

Both General Electric assemblies and Magne-blast circuit breakers are shipped completely assembled. This service feature results in greater safety for personnel and reduced installation time and expense.

G-E Metal-clad is available in voltages from 4.16 to 13.8 kv, and in interrupting capacities from 75 to 1000 mva. This full range of voltages and capacities enables you to select switchgear "tailored" to your present or projected system needs . . . yet you pay no premium for special engineering or construction, thanks to many conventional ratings.

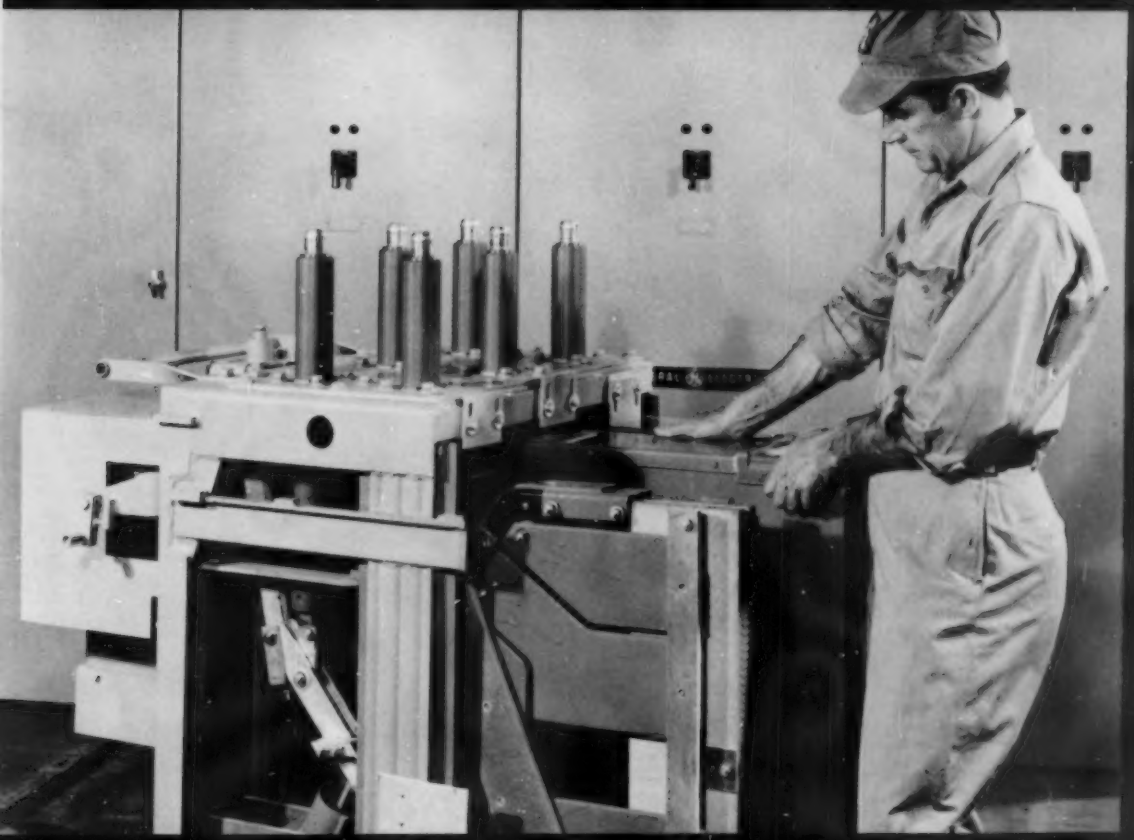
FOLD OUT FOR STEP 3

GENERAL ELECTRIC



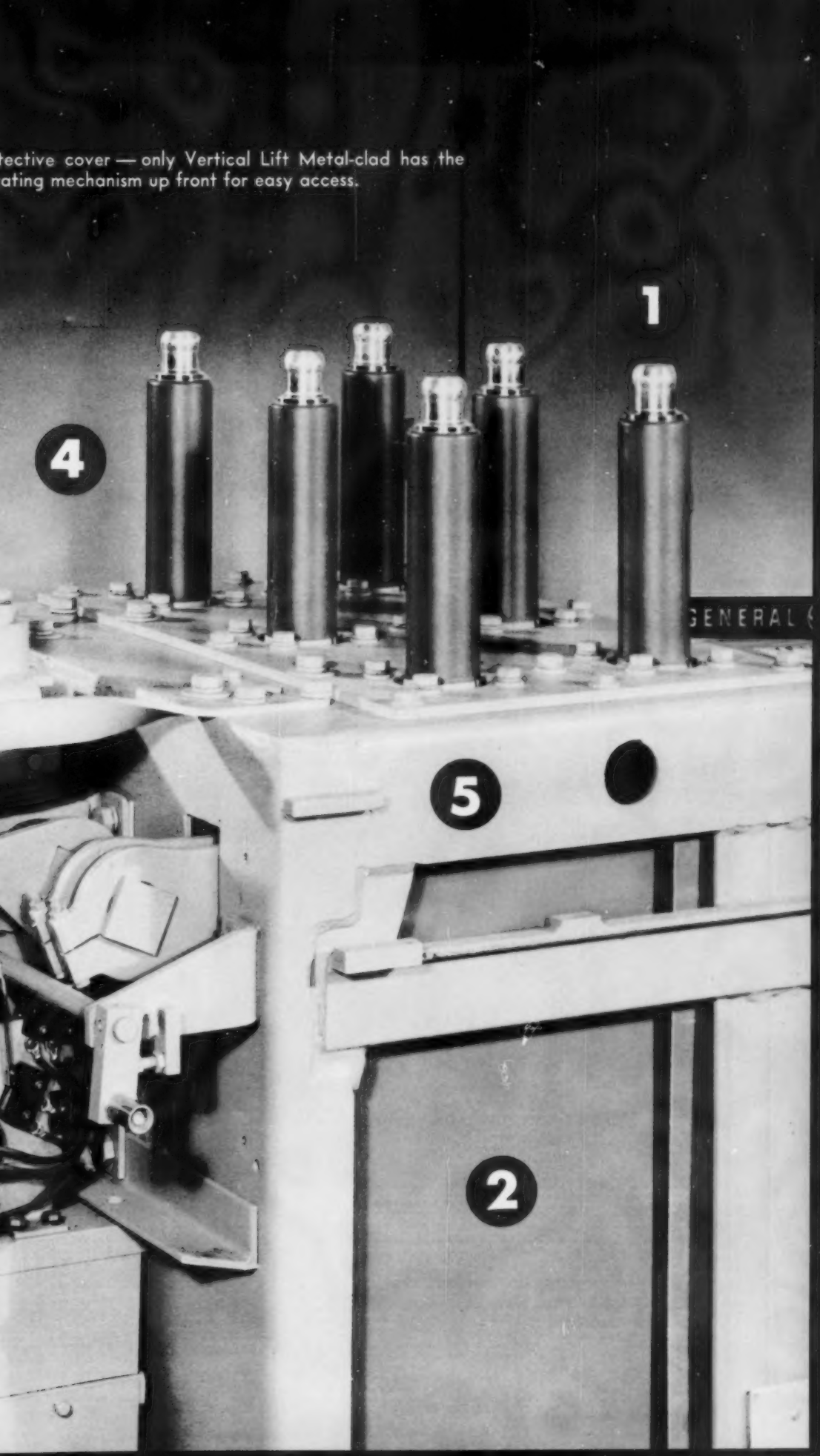
STEP 1: Disconnect breaker automatically—only Vertical Lift design permits operator to actually see when disconnects are parted.

STEP 2: Remove breaker, box barrier — Vertical Lift design allows operator to inspect contacts without removing arc chutes.



STEP 3:
Remove protect
breaker operati
3

tective cover — only Vertical Lift Metal-clad has the
ating mechanism up front for easy access.



In addition to exclusive design features...

G-E application and service engineers pre-engineer your Metal-clad switchgear installation... give continuing service

The first step in the extensive service you receive with General Electric Metal-clad switchgear is the expert problem-solving and planning assistance from your G-E sales engineer.

Next, G-E application engineers study your system, offer suggestions for efficient, economical installation, and monitor project progress.

G-E guide-form specification sheets simplify the ordering of Metal-clad switchgear units — your engineering expenses can be reduced through the use of this General Electric system planning assistance.

When necessary, your Metal-clad equipment is inspected and test-checked at the time of installation to assure a satisfactory hook-up to your power distribution system.

When you plan a new or expanded system, call in your G-E sales engineer early so that he can give you maximum assistance in satisfying your switchgear needs. Write for this detailed switchgear bulletin — GEA-5664E, to Section 511-36, General Electric Company, Schenectady 5, N. Y.

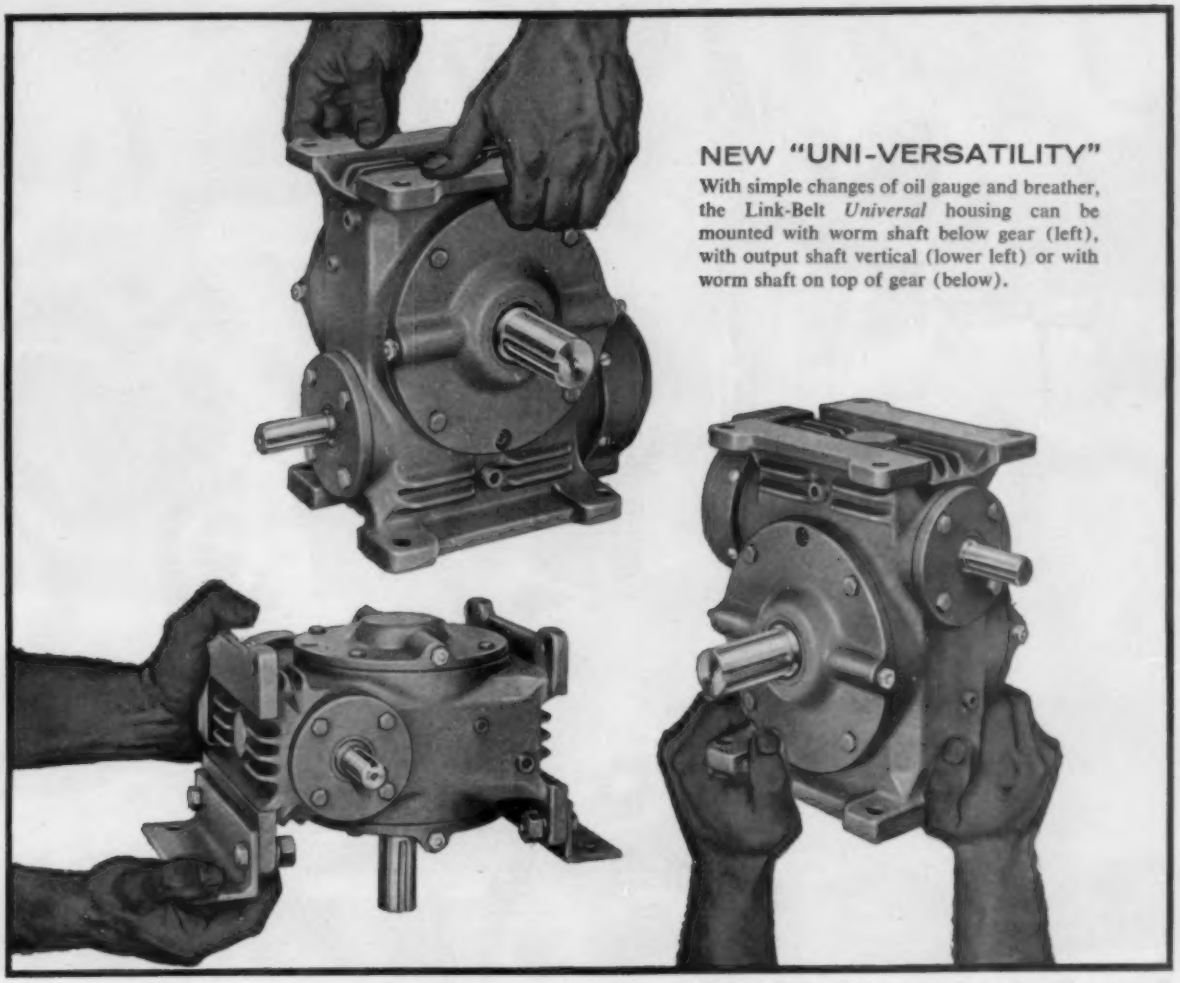
Contact your General Electric switchgear representative for more information about your best buy — G-E Vertical Lift Metal-clad switchgear

Progress Is Our Most Important Product

GENERAL ELECTRIC

PRINTED IN U.S.A.

This "worm" turns to mount any way



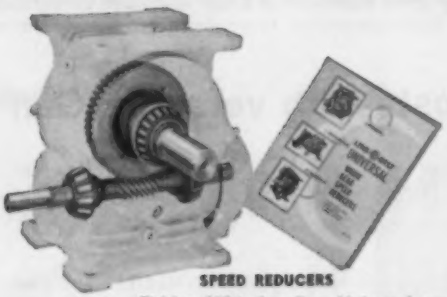
NEW "UNI-VERSATILITY"

With simple changes of oil gauge and breather, the Link-Belt *Universal* housing can be mounted with worm shaft below gear (left), with output shaft vertical (lower left) or with worm shaft on top of gear (below).

In any position, Link-Belt Universal worm gear speed reducers deliver highest hp per pound, per dollar

Universal is right! *In its mounting versatility*, adaptable to any required position. *In its application*, for a limitless range of speed reduction jobs. *In its availability*, from a cross-country distributor and warehouse network.

The *Universal* features a simple, compact design that packs maximum hp in a small housing. Initial cost is low, mounting space requirements slight.



SPEED REDUCERS

Folder 2724 describes Universal worm gear speed reducers having 2½", 3", 3½" and 4" centers with ratios from 5⅛:1 to 60:1. 15.16R

LINK-BELT

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada; Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World.

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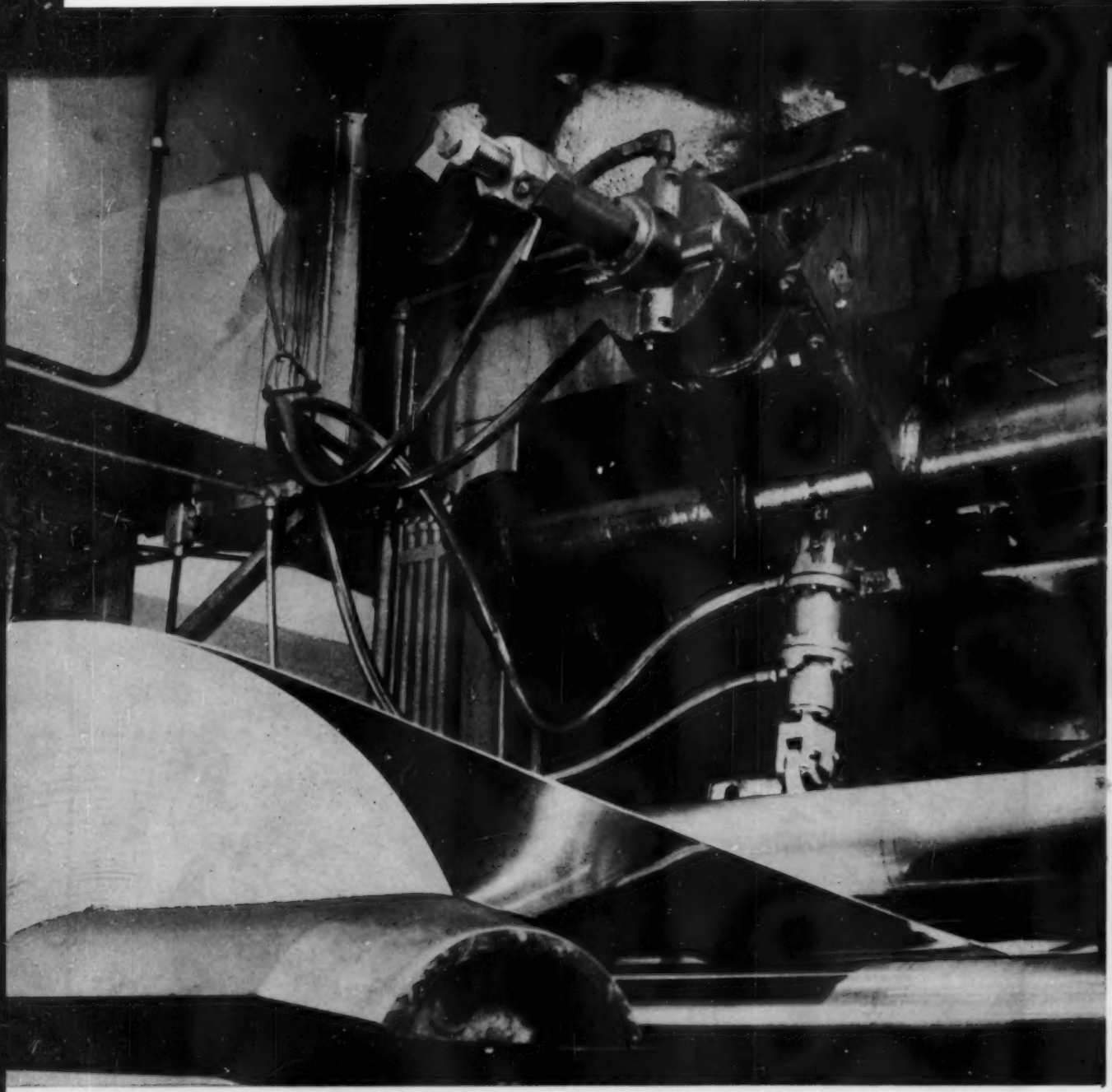
←For more facts circle 523 on Reply Card



Custom rolling sheet aluminum at Sheet Aluminum Corporation, Jackson, Michigan. All hydraulic systems in the plant are filled with Gulf Harmony oil. Photo shows processed aluminum being wound on tension reel at delivery end of mill.

Cut costs with versatile Gulf Harmony® for plant lubrication

GULF MAKES THINGS

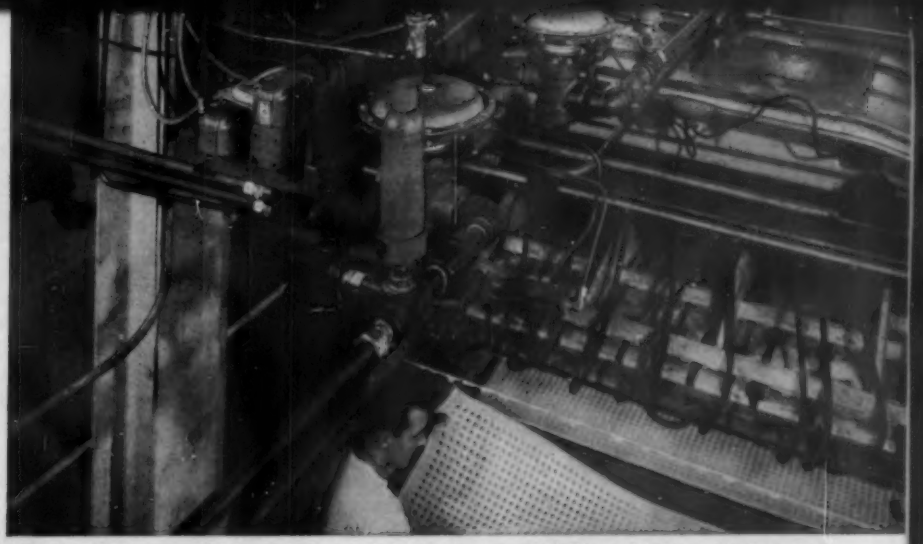
Using numerous special purpose lubricants? Here's relief. You can meet virtually every oil requirement in your plant—including fluid power for hydraulic systems —with Gulf Harmony.

In central lubricating systems, hydraulic systems, in the lubrication of dryer roll bearings, air compressors, blowers, machine tools, electric motors and a host of other applications—Gulf Harmony can save you money and simplify your oil problems.

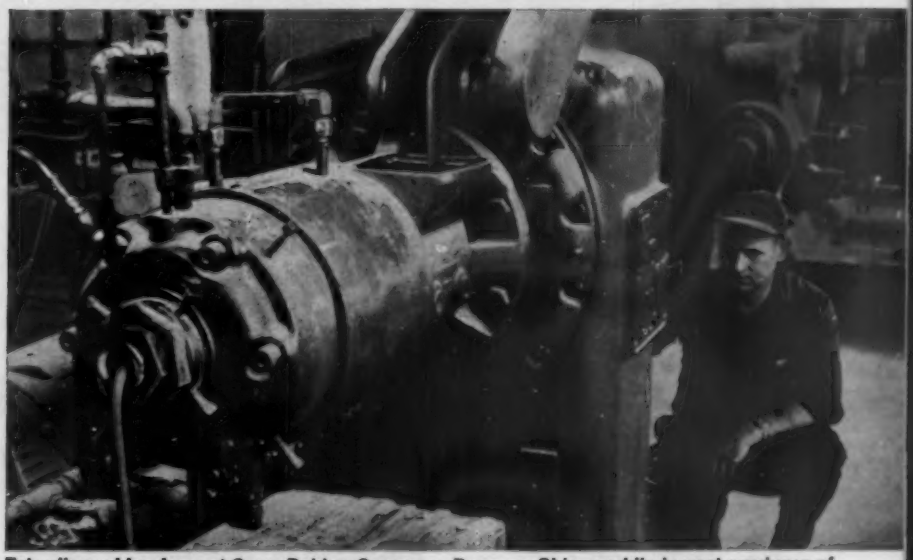
The unusually high oxidation resistance of Gulf Harmony assures longer life—for both machine and lubricant—and freedom from harmful sludge deposits.

In addition, Gulf Harmony maintains its original viscosity and color stability for exceptionally long periods.

A patented anti-foam agent in Gulf Harmony prevents objectionable foaming. And there is a strong anti-corrosion additive that protects against rust. Gulf Harmony oil performs remarkably well in bearings exposed



Moulding Texfoam mattresses at the B. F. Goodrich Sponge Products Division, Shelton, Connecticut. Here, through hydraulic equipment as shown in upper foreground, Gulf Harmony supplies fluid power for 125 moulding presses.



Extruding rubber hose at Swan Rubber Company, Bucyrus, Ohio, world's largest producer of garden hose. The many precision gears in the speed reduction units of the extruder shown here operate in a bath of Gulf Harmony oil.

and hydraulic systems . . . see how

RUN BETTER!

to high ambient temperatures and humid atmospheres.

You name the application—and your Gulf Sales Engineer will gladly recommend the proper grade of Gulf Harmony. He'll also show you how this versatile oil can help cut your maintenance costs and simplify your lubricant storage and handling.

If you have a lubrication problem at your plant, we invite you to see how Gulf makes things run better. Just call your nearest Gulf office, or mail the coupon.

GULF

GULF OIL CORPORATION
Dept. DM, Gulf Bldg., Pittsburgh 30, Pa.

Please send latest illustrated bulletin on Gulf Harmony.

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Title_____
Company_____
Address_____
City_____ Zone____ State_____

For more facts circle 525 on Reply Card

PLANT ENGINEERS' DIGEST —so those who rush may read and know what's new

Edited by Marjorie E. Weissman

Locating Utilities Easily

FOR OLDER AREAS of our plant there are often only skimpy records of the location of utilities. Occasionally, it is necessary to pinpoint underground pipelines. Where drawings were not available, we had to

Water main is traced with receiver. Transmitter unit is seen in foreground.

rely on the memory of employees or make exploratory excavations. Now, however, we use a portable electronic set such as is used by telephone company crews for locating underground cables.

The tiny transmitter sets up a field in which the underground line is the conductor. By moving the receiver along the ground, the operator picks up a tone that locates the line. Then, by tilting the receiver 45 deg, depth of the line can be reckoned geometrically. *From The Staley Journal, published by A. E. Staley Mfg. Co., Decatur, Ill.*

Fire Protection for Computers

ELECTRONIC COMPUTERS are easily damaged by fire and smoke, but if discovered promptly, a fire can usually be extinguished through removable panels. Carbon dioxide is recommended because it does not damage delicate electrical contacts. A supply of portable 15- or 20-lb extinguishers should be available.

Fixed automatic carbon dioxide protection may be justified for some computer units depending upon how serious the consequences of a fire would be.

A computer installation can also be damaged by a fire external to itself. Location and building construction are important. A cutoff noncombustible building or room is most desirable. If in a lower story, the floor above should be completely watertight so that water used on a fire in upper stories will not leak through and damage the equipment. If the floor cannot be made watertight, waterproof covers should be provided for computer equipment.

Raised floors in computer rooms should be non-combustible, metal-

Power connections to computer unit from cables laid below raised floor.

clad, or approved fire-retardant-treated lumber, with removable panels. One type is supported on metal pedestals, permitting cables to run in any direction. In another type, cables are located in raceways or metal troughs. Some existing raised floors are of untreated wood-joist construction and where practical, automatic sprinklers should be installed under these floors or they should be replaced with non-combustible construction. Where neither is practical, automatic carbon dioxide protection is recommended.

The computer room itself should be protected by automatic sprinklers if combustibles are present in wall or ceiling construction or in the occupancy other than computer equipment. *From Factory Mutual Record, published by Factory Mutual Engineering Div., Norwood, Mass.*

Safe Trips for Bearings

A POLYETHYLENE buffer has been developed by our company to prevent damage to miniature and instrument bearings during shipping.

Different quantities and sizes of bearings are shipped in any one of six standard plastic vials. The remaining air-space is filled with the polyethylene buffers, so that bearings are tightly pressed against each other. By eliminating the chance to jiggle, damage in transit is prevented.

The plastic buffers offer several advantages over the oil-damping techniques usually used. They are lighter in weight, and do not lose their resilience, but maintain constant pressure against the bearings. The buffers hold the bearings firmly in one position without shifting. The

Plastic buffers keep tiny bearings undamaged during shipping to customers.

user receives bearings having only the necessary film of protective lubricant, rather than an oil bath

adds greater value to CROUSE/HINDS EV Series explosion-proof lighting fixtures

Now, at no extra cost to you, this new Crouse-Hinds Prismatic Globe reduces troublesome glare while increasing "seeing" brightness. Provides more efficient working light, by softening and distributing the light evenly – without reducing the amount of usable light.

By eliminating "hot spots", the Crouse-Hinds Prismatic Globe reduces eye-fatigue . . . especially important in areas where reduced worker efficiency is itself a potential hazard. Prisms are inside the globe to keep the exterior dust-free. Prismatic Globes are furnished with 100, 150, 200/300 and 300/500-watt sizes of Crouse-Hinds EV Series explosion-proof lighting fixtures.

- **Reduces glare**
- **Gives uniform brightness**
- **Eliminates normal "hot spot" below fixture**

Crouse-Hinds Series EV Explosion-Proof Lighting Fixtures are easy to install and relamp, provide high lighting efficiency in areas classified as Class I hazardous by National Electrical Code. Available in choice of mountings, with a variety of reflectors for incandescent and mercury-vapor lamps.

CROUSE/HINDS
SYRACUSE / NEW YORK

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For more facts circle 526 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 46)

which might spill over his work area. Above all, the polyethylene buffers are completely free of lint or other minute contaminants, a major factor in shipping precision bearings which can be put out of commission by a speck of dust. *From a release of New Hampshire Ball Bearings, Inc. Peterborough, New Hampshire.*

Ventilating, Heating Systems Can Be Fire Hazards

AIR CONDITIONING, warm air heating and ventilating systems distribute air streams rapidly and thus can distribute fire or smoke through the areas they serve. To minimize this inherent hazard to life and property, it is important that good practice be followed in the installation of systems and that adequate safeguards be provided as conditions require.

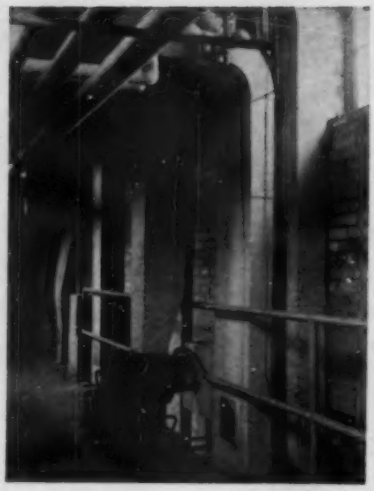
The following points should be considered:

Fresh air intakes should be located to avoid drawing in combustible material and to minimize possibility of smoke and fire entering the system from outside source.

Only non-combustible material should be utilized in the construction, lining and covering of ducts. Adequate clearances should be maintained between ducts and combustible construction or storage.

Approved automatic fire dampers should be provided in the duct system. Where penetration of fire walls is necessary, automatic fire doors are essential.

Fans should be equipped with manual controls at readily accessible points to permit prompt shutdown in case of fire. Fans should also be stopped by detecting devices.



Separate ducts for supplying each floor reduces number of dampers required, permits selective shutdown of ducts.

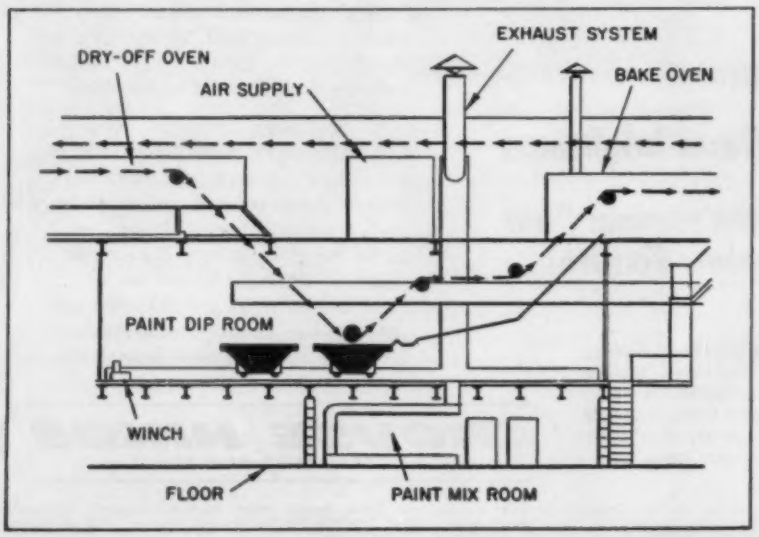
Sprinklers are normally desirable for protection of filters. Necessity is

(Continued on page 50)

Method for Reducing Downtime in Paint Color Changeover—It Takes Only 15 Minutes

A TECHNIQUE for reducing downtime when changing colors on an automatic paint dipping line has been developed for the new Lincoln, Ill. plant of Cutler-Hammer Inc. The method which can be adapted for either ground floor or mezzanine production line, employs a paint dip tank mounted on wheels, space for a suitable length of track, a tank moving arrangement and quick, manual disconnects for paint supply lines. Only a 15 minute delay of the conveyor or line is necessary to change from one color to another.

A double dip tank is used and the system is arranged so that the dip tank in use is always in the center, at the lowest dip point of the automatic conveyor transporting the parts. About 60 ft of track space is provided to move the wheeled dip tanks in and out of position. To change the color paint, it is necessary only to disconnect dump line connections and start an air-operated winch with a drum cable, to pull one dip tank out of center position and spot the second. Quick couplers are used on the dump lines.



Only 15 minutes are needed to change paint color in double-dip tank system.

In shifting colors, each dip tank, which measures 8 ft wide by 10 ft long and holds 1000 gal of paint, is moved about 12 ft. Only one worker is required to break the connections, move the tanks and hook up the system again.

Dump tanks in the system are located outside the building, below the mezzanine floor. Since the paint supply area for each color is under the dip tanks, the latter are supplied with additional paint by opening a valved connection in a paint recirculating line. *From a release of R. C. Mahon Co., Industrial Equipment Div., Detroit, Mich.*

He's mopping up the mess for the last time

At a leading aircraft research center, high-frequency vibration caused severe oil leakage from hydraulic lines servicing a huge wind tunnel. Many man-hours each month were wasted cleaning up the basement floor underneath, even though drip pans were used extensively.

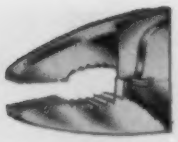
Now, after a change to a Suntac oil, the vibration-caused leakage has been reduced to a point where "mop-up" is not needed. Hydraulic-fluid consumption has been cut by 4000 gallons a year. That's economy! That's Sun quality—the best economy of all.

If your plant is troubled with a leaky system, a Suntac antileak hydraulic oil can save you money, too. Ask your Sun representative to show you the Suntac desk-top demonstration, or write direct to SUN OIL COMPANY, *Philadelphia 3, Pa., Dept.* *In Canada: Sun Oil Company Limited, Toronto and Montreal.*

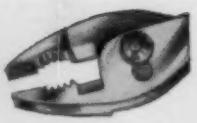
SUNOCO

MAKERS OF FAMOUS CUSTOM-BLENDED BLUE SUNOCO GASOLINES

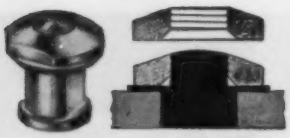
For more facts circle 527 on Reply Card



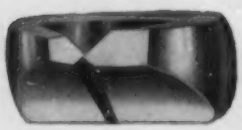
Flat end snubs against object and grips where rounded nose pliers would fail.



Deep cut-teeth provide secure grip. Curved sections have large, deep-broached teeth to grip pipe, etc.



Special slotted washer and chamfered nut provide lock-washer action — will not work loose.



Overlap shear action cuts better — saves edge . . . provides non-slip action.

Star chamfer holds rivet from turning — holds jaws in alignment.

Special hardening and precisely machined joints keep needle-nose jaws in line.

Tips for Measuring the Real *Work Ability* of Pliers

Check the photos above. Shown here are features you have a right to expect in a plier or cutter — features you *get* when you buy SNAP-ON.® In addition, SNAP-ON gives you —

Through hardening for extra toughness.

Broached stud-positioning hole for true bearing surface and snug, easy-working joint.

Drilled and reamed rivet holes on needle-nose for easy use.

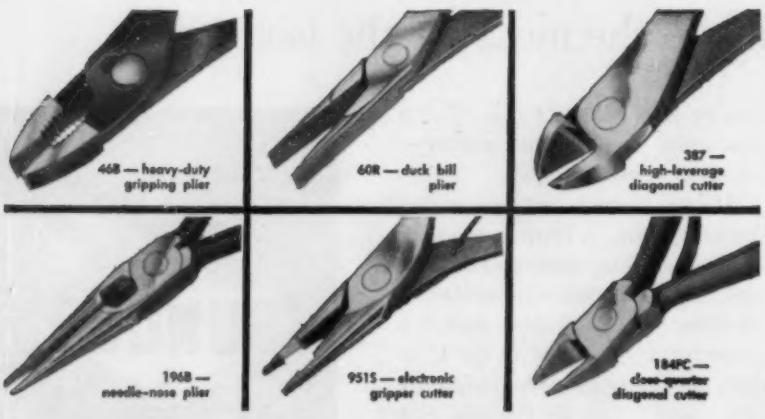
Broached and ground joint surfaces for smooth operation, snug fit.

Engineered handle design for correct leverage.

Over 60 models and sizes to let you choose the best one for your production or maintenance job.

Your SNAP-ON Sales Engineer can give you more information on the complete plier line. There's a SNAP-ON Branch Office in every major U.S. industrial center.

Or write for catalog listing the complete series, plus full range of wrenches and hand tools.


468 — heavy-duty gripping plier
608 — duck bill plier
387 — high-leverage diagonal cutter
1968 — needle-nose plier
9515 — electronic gripper cutter
184PC — close-quarter diagonal cutter

SNAP-ON TOOLS
CORPORATION
8068-C 28th Avenue • Kenosha, Wisconsin

For more facts circle 528 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 46)

determined by the type and combustibility of filter, its coating and type of accumulation of foreign material.

Heating units and mechanical refrigeration equipment should be arranged in accordance with applicable standards so that a fire hazard is not introduced directly into a system.

Most cooling towers are of combustible construction. Experience dictates the need for installing automatic sprinkler protection in this type of tower. A proper maintenance program should be established and inspection and cleaning put on a regular schedule according to need. *From Sentinel, published by Factory Insurance Association, Hartford, Conn.*

UPVC Beats Sulfuric Acid

Piping and valves of UPVC handles 93.19 per cent sulfuric acid used to regenerate mineral beds at Upjohn Co., Kalamazoo, Mich. Plug valves have been maintenance-free since installation in 1957. (From a release of Tube Turns Plastics, Inc., Louisville, Ky.)

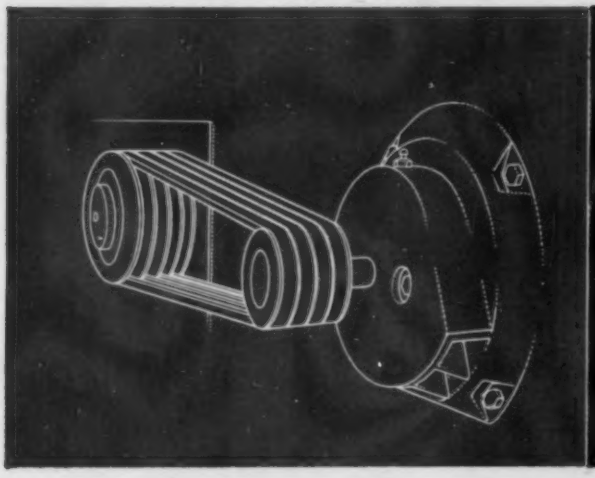
Handling Aluminum Coil

COILS OF ALUMINUM strip are handled quickly but carefully with a recently-developed type of vertical coil tongs at the Ravenswood Works of Kaiser Aluminum and Chemical Corp., Ravenswood, W. Virginia.

Picked up one at a time from the inspection conveyor, the coils are tiered three or four high for pack-

BEFORE: This drawing of the former 4-belt drive on a clothes pressing unit is in the same scale as the photo of new Super HC V-Belt Drive at right. Heavy sheaves needed for 4 belts imposed high bearing loads.

AFTER: By redesigning the drive for Gates Super HC V-Belts only 3 belts are required and this Utah manufacturer saves 16 pounds in weight and 24% on the drive cost of every pressing unit it makes.



Manufacturer of pressing equipment cuts cost of drives 24%

New high capacity V-belt also saves weight and space!

This manufacturer is just one of many who have already turned to Gates Super HC V-Belts to achieve far more compact, lighter weight, lower cost V-belt drives for all types of machines. With new Super HC V-Belts, sheave dimensions can be reduced 30% to 50%, overall space up to 50%, and drive weight by 20% and more.

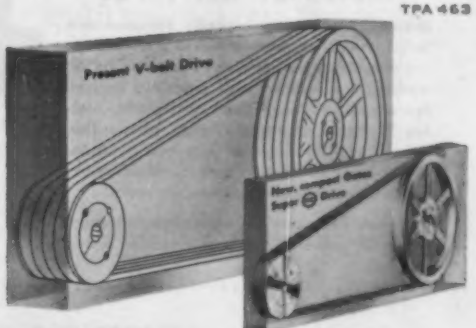
A product of Specialized Research in the world's largest V-belt laboratories at Gates, the Super HC V-Belt Drive is already standard equipment on production models in virtually every industry.

Engineering Service Nation-Wide

Whatever your plant's power transmission design problem, wherever you are, your nearby Gates Distributor or Field Representative is ready to assist you to cut space, weight, and costs with Super HC. Ask him for a copy of *"The Modern Way to Design Multiple V-Belt Drives."*

TPA 463

The Gates Rubber Company, Denver, Colorado
Gates Rubber of Canada Ltd., Brantford, Ontario



Gates *World's Largest Maker of V-Belts*

Gates Super HC V-Belt Drives same hp capacity in smaller "package"

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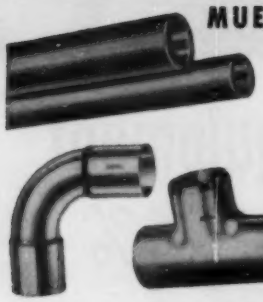
You Can Get Everything
for every kind and type of
INDUSTRIAL PIPING SYSTEM
From *ONE* Dependable Source



MUELLER BRASS CO. *Streamline*
COPPER TUBE AND FITTINGS

Streamline Copper Tube and Solder-Type Fittings make a tight, sanitary system with clean, unobstructed joints that withstand jars and vibrations. Streamline tube and fittings are lightweight, (longer lengths can be conveniently handled, eliminating many fittings); resist corrosive acids, clogging, will not rust. Products available include K, L, M and DWV copper tube as well as both cast and wrought solder-type fittings in a complete range of sizes.

MUELLER BRASS CO. PVC
RIGID PIPE AND FITTINGS

PVC for industrial piping withstands shock, impact, vibration and twisting; can be used at higher pressures than other similar materials. PVC resists corrosive action of water, oil, alkaline or salt solutions, gases and a wide variety of acids. Economical, lightweight, PVC is fabricated in 20' lengths; ½" through 3" sizes.

MUELLER BRASS CO.
VALVES OF ALL TYPES

Streamline valves are ruggedly designed and built to give years of trouble-free service. They are made of non-porous, cast red brass and all working parts are precision machined for perfect alignment of seating surfaces. Positive seating is further assured by tough composition discs. Complete range of sizes and styles includes compression stops, gate, globe and swing check valves, boiler drains and sill cocks.

Write today for complete information on Mueller Brass Co. products for any industrial piping system.

282

MUELLER BRASS CO.
PORT HURON 52, MICHIGAN
For more facts circle 530 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 46)

Tongs grip aluminum coils of variety of sizes without marring the surface.

ing and shipping. Careful handling is necessary to avoid damaging the strip.

The tongs used for this operation can be adjusted for outside diameters from 25 to 40 in., and for inside diameters of 3 to 8 in. They can be used where headroom is limited, and will carry coils weighing up to 1000 lb. The under surface of the tongs frame is lined to protect the top surface of the coil. *From a release of Hepenstall Co., Materials Handling Div., New Brighton, Pa.*

Boxes, Pallets Make Easy Handling for Castings

A NEW MATERIALS HANDLING system built around the use of white corrugated shipping containers sta-

Castings are handled in corrugated boxes stapled to expendable pallets.

Armstrong announces Armaflex 22 —a new, improved pipe insulation

An improved flexible foamed plastic pipe covering, with a broader temperature range and a super-smooth surface finish, has been developed by Armstrong.

This easy-to-apply insulation can be used on hot lines operating up to 220° F., as well as on all cold piping at temperatures down to zero and below. The new, smooth surface gives every installation a neatly finished look.

In addition to being an efficient insulator, Armaflex 22 has high resistance to water and vapor penetration, is self-extinguishing, ozone resistant, and has negligible odor.

Armaflex 22 is made in 6-ft. lengths, in ⅜", ½", and ¾" wall thicknesses for pipe and tubing from ⅜" to 3⅛" i.d.

For free booklet on Armaflex 22, write Armstrong Cork Company, 2203 River Road, Lancaster, Pa.

COMPARISON CHART

Here's how the physical properties of Armaflex 22 compare with other flexible foamed plastic pipe coverings.

Physical Properties	Armaflex 22	Brand A	Brand B	Brand C	Brand D
Low Density less than 7.5 lb./cu. ft.	Yes	No	Yes	Yes	Yes
Low Water Vapor Transmission less than .15 perm	Yes	No	No	Yes	No
Low Water Absorption less than 3% by volume — 28 days	Yes	No	No	Yes	Yes
Dimensionally Stable at 220° less than 5% lineal shrinkage — 28 days	Yes	No	No	No	No
Dimensionally Stable at 200° less than 5% lineal shrinkage — 28 days	Yes	Yes	Yes	No	No

Properties evaluated at Armstrong Research and Development Center

Armstrong INSULATIONS

1860-1960 Beginning our second century of progress

For more facts circle 531 on Reply Card

TENNANT Industry's most complete line of POWER SWEEPERS

TENNANT Model 40 Sweeper

HERE IS America's most complete and widely used line of power sweepers . . . for plants of all sizes.

If your plant is not already using a TENNANT Sweeper, you'll be surprised at its performance . . . and the savings it can bring you.

FOR CONGESTED AREAS—A compact NEW walk-behind Sweeper (Model 40). Cleans 34″ path, turns in its own tracks. *Equals "big sweeper" performance for* CLEAN *sweeping!* Sweeps 8 to 18,000 sq. ft. per hour in most plants . . . or 2 to 5 times faster than a man with a broom. Very powerful brush-and-vacuum system: out-performs any other sweeper of its size for clean, dust-free work. Low priced. Available in gas, LP-gas, and battery-powered models.

FOR SMALL PLANTS — Versatile space-saving Sweeper (Model 53) cleans 40″ path on the run. Travels at 1½ to 5 mph, *sweeping 3 to 7 times faster than is possible by hand.* Rider-type; easy to use. Combined brush and vacuum system instantly removes chips, sand, debris, dirt and dust that pushbrooms can't pick up.

Compact design and easy steering make the "53" ideal for both congested and open areas. Auto-type steering, clutch, and brake. Often pays for itself in 9 to 14 months. Available in both gas or LP-gas models.

TENNANT Model 53 Sweeper

TENNANT Model 80 Sweeper

FOR HEAVY DUTY SWEEPING—The superbly engineered Model 80 is *industry's choice for rugged, 'round-the-clock sweeping.* Has no equal for performance. Cleans 53″ path. Sweeps up to 110,000 sq. ft. per hour in open areas, yet is "aisle-designed" to operate efficiently in aisles as narrow as 5 ft.

Easy to operate: starts, stops, reverses instantly. Dirt hopper holds up to 800 lbs., dumps hydraulically in 10 seconds. Gas or LP-gas models; similar battery-powered model available.

FOR MAXIMUM CAPACITY, here is the giant Model 100. *Has 3 to 4 times the capacity of smaller sweepers.* Cleans 7′ 4″ path, yet has turning radius of only 10′ 2″. Hydraulic dump hopper holds almost 2 yards.

Excellent dust control and huge capacity make it ideal for yards, docks, salvage work, large aisles, etc. Nothing else like it!

Write today *for illustrated bulletins on Tennant Power Sweepers. Get details on how to reduce your sweeping costs.*

TENNANT Model 100 Sweeper

G. H. TENNANT COMPANY, 771C N. Lilac Drive, Minneapolis 22, Minnesota

SPECIALIZED MAINTENANCE EQUIPMENT

POWER SWEEPERS • FLOOR MACHINES • SCARIFIERS • ROOF SCRAPERS • CONCRETE ROUTERS

For more facts circle 532 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 46)

pled to expendable pallets, has transformed the handling of loose castings at The Dalton Foundries, Inc., Warsaw, Ind., into a single handling, materials flow.

The containers are used in the finishing, grinding and cleaning department. When they are filled with loose castings, fork lift trucks carry them from this work station into storage areas where they are placed on metal racks.

After an order is completed, the pallet-containers are then loaded by fork truck directly onto the carrier in which they are shipped to customers.

In the past, castings were tossed into metal barrels or heavy wooden boxes, then carried to a large storage area where they were dumped into loose piles on the floor. *From a release of Mead Containers, Div. of Mead Corp., Dayton, Ohio.*

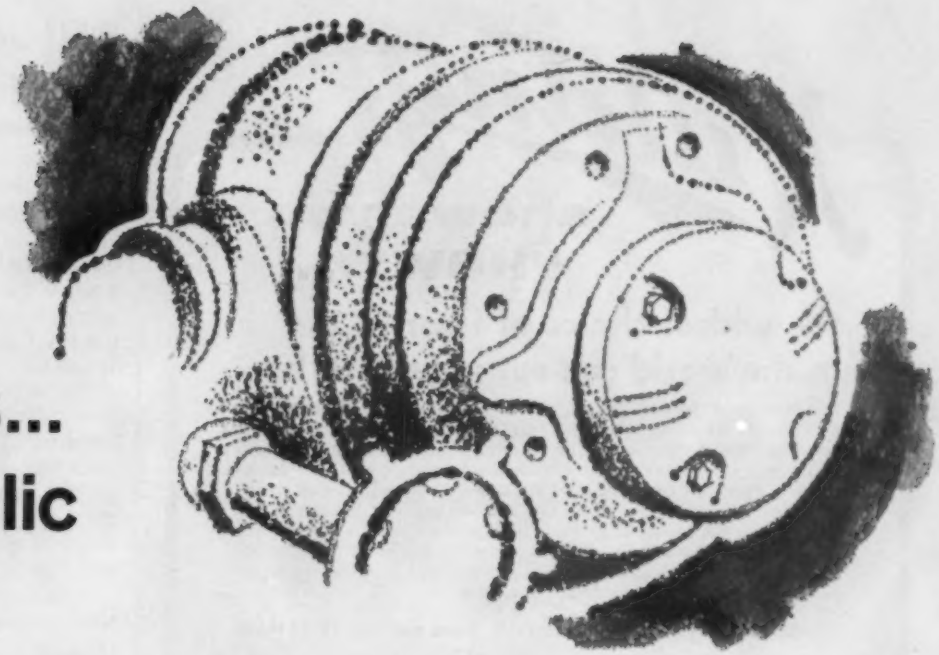
Cover for Storage Tank

Plastic cover on fixed-roof liquid storage tank admits light and air to interior during maintenance. Cover is readily penetrated by gooseneck of foam tower in case of fire. (From Foam Facts, published by National Foam System, Inc., West Chester, Pa.)

Storing Coated Abrasives

TESTS AND RESEARCH into useful length of sandpaper life indicate that from 5 to 75 per cent additional life can be gained from coated abrasives depending upon storage conditions.

Heat and humidity are the principal factors to be controlled in the sandpaper storage environment to



Pumps... hydraulic oil... and profits

Faulty hydraulic pumps cut production. Rust, varnish and sludge interfere with precise control—in many cases bring a production line to a dead stop and whittle profits. Special inhibitors in Sinclair Duro Hydraulic Oils have earned the reputation for protection against varnish and sludge. Furthermore, Duro's rust inhibitor has a preferential metal-wetting action that forms a tough barrier against water penetration. Next time management asks how you've cut costs, tell them you've switched to Sinclair Duro...and show them the results.

Call your **Sinclair Representative** for further information, or write for free literature to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y.

Sinclair

Sinclair

Duro Hydraulic Oils

For more facts circle 533 on Reply Card

Nutting shows you "HOW"...

the widest choice of floor trucks in the world can cut your costs!

For regular or "special" design floor trucks it pays to talk to Nutting *first*. Here's why: no other company makes more models, sizes or combinations of equipment than Nutting. Many times items which you may find listed as "specials" with other makes are regular equipment in Nutting's complete line. As a result you get "custom built" trucks at production line prices. You not only get overall lower prices; you also get the benefit of 68 years of experience, design "know-how" and modern manufacturing skills. To save valuable hours of your time and get the right equipment for your plant, talk to a Nutting representative *first*, for all your floor truck needs!

Nutting makes over 1000 products, here are just 16 of them

For appliances and finished products

Wagon trucks up to 10,000 lbs. capacity

All types of dollies for boxes & cases

For sub-floor & overhead drag lines

Trailers — up to 7,000 lbs. capacity

CASTERS — all types

WHEELS — demountable rubber tired, solid rubber, plastic & metal

Shelf and tray trucks

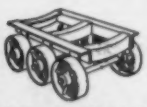
2 wheelers for freight

Steel & aluminum frames for cases & cartons

Drag line trucks & trailers for palletless handling

Non-tilt platforms — Wood & steel frames

Shelf trucks for sub-assemblies


Dollies for cylindrical & odd shaped items

Triform & box trucks for packages & bundles

"Auto-Load" barrel & drum trucks

Tilt style platforms — Wood & steel frames

Dollar for dollar, feature for feature Nutting is your best floor truck buy. Write for your free copy of new Junior Catalog 59G.

Nutting

TRUCK AND CASTER COMPANY
Faribault, Minnesota

NUTTING TRUCK & CASTER COMPANY
492 Division Street • Faribault, Minnesota
Please send copy of Junior Catalog 59G.

NAME_____
COMPANY NAME_____
ADDRESS_____
CITY_____ STATE_____

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PLANT ENGINEERS' DIGEST

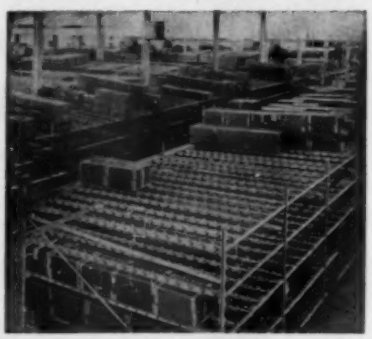
(Digest begins on page 46)

gain optimum life. Stored in areas where there is a constant variation of temperature and humidity, coated abrasives are subject to a continuous cycle of structural stresses that weakens the bond. Waterproof backings are not a guarantee against possible damage from humidity variation.

Six general rules can be employed for obtaining maximum performance from coated abrasives. Each rule is considered equally important and the manner in which they are listed should not place a descending order of value on its observance.

1. Keep temperature about 70 F with relative humidity at 35 to 50 per cent.
2. Keep cartons off the floor to prevent moisture pickup from damp floors.
3. Store opened boxes flat on shelves and not on end, to prevent damaged edges.
4. Open cartons only when needed.
5. Rotate stock and where possible use older shipment first.
6. Hang used belts on level hangers to prevent edge damage and keep pegs or hangers as wide as practical to prevent damaging the backing or bond. *From a release of Michigan Abrasive Co., Detroit, Mich.*

Racks Change Width To Suit Cartons



Live storage racks, width of which can be changed by moving rails to one side or the other, were erected at Springday Co., Springfield, Mo., before carton size was established. Racks readily accommodate any changes in size of the cartons. (From a release of Alvey-Ferguson Co., Cincinnati, O.)

NEW DRAW-OUT DESIGN

LIMITAMP* MOTOR CONTROL

DRAW-OUT CONTACTOR

. . . cuts Limitamp control installation time

Rated 2300- to 4600-volts for a-c motors up to 3000 hp.

A draw-out contactor which automatically connects or disconnects as it is rolled in or out of the enclosure!

This is just one of the revolutionary design features in General Electric's new Limitamp motor control . . . a new design which cuts installation time in half!

During installation the contactor is easily withdrawn, leaving ample room to enter the enclosure, pull both motor and incoming power cables and make connections. When cables are connected, barriers are placed in position to seal off incoming line cable and a-c bus. The motor cable—located in its own raceway—is completely accessible when the starter is de-energized.

As the contactor is rolled back in, stab-on contacts automatically plug into the de-energized power circuit. At the same time, control power is automatically engaged. Installation time is held to a minimum.

Ask your G-E Apparatus Sales Engineer about other advanced-design installation, operation, performance and maintenance features of new Limitamp control. Or, write Sect. 783-11, General Electric Co., Schenectady, N. Y. for Bulletin GEA-6893. Industry Control Dept., Salem, Va.

Progress Is Our Most Important Product

GENERAL ELECTRIC

* Reg. Trade-mark of General Electric Company

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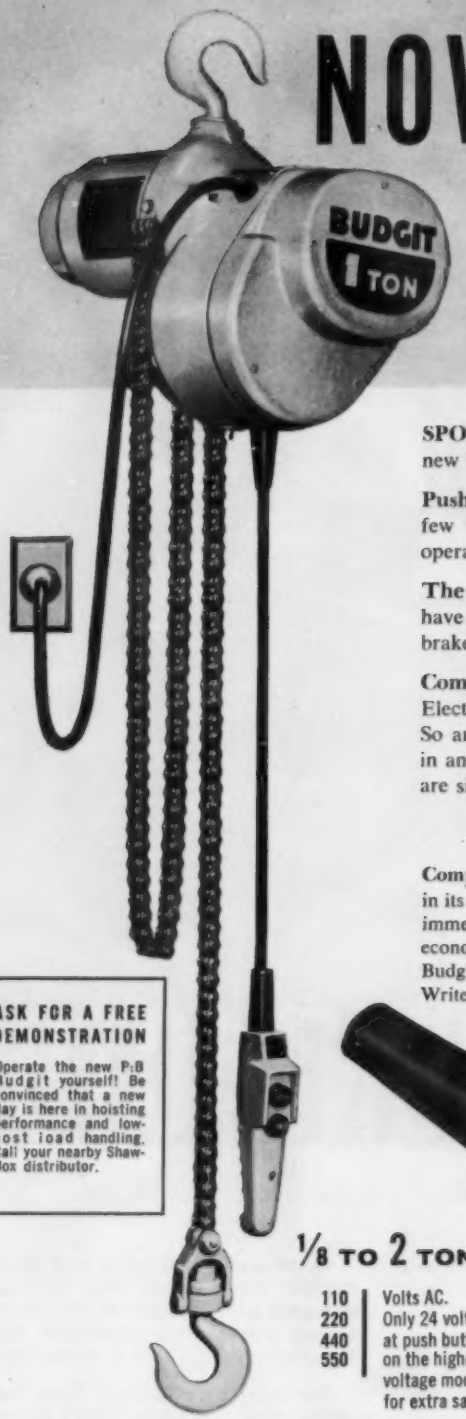
NOW P:B BUDGIT®

ELECTRIC HOIST

"FRACTURES FRACTIONS"



SPOTTING speed and accuracy are "right on the button" with this new Push Button Budgit Electric Hoist.

Push button action is so sensitive you can spot loads precisely in a few ticks of time. The control station fits the palm for one-hand operation, leaving the other hand free to guide the load.

The P:B Budgit has two automatic brakes. Heavy-capacity cranes have the same type of load brake. It's the only hoist with mechanical brake built into the motor. Each brake alone can hold the load.

Compartmented components add still more value to the P:B Budgit Electric Hoist. All electricals are enclosed, safe from dirt and moisture. So are the motor and motor brake. Gearing and load brake operate in an oil bath, sealed against airborne substances. Maintenance needs are simple as can be.

SEE BULLETIN FOR DETAILS

Compare the new P:B Budgit Hoist with any other electric in its class. It's a portable hoist you hang up, plug in, and use immediately with top efficiency, safety, convenience, and economy. Get full details, plus data on pull cord operated Budgit Hoists in AC, DC, and 12-volt battery powered models. Write for Bulletin 15010-15C today.

ASK FOR A FREE DEMONSTRATION

Operate the new P:B Budgit yourself! Be convinced that a new day is here in hoisting performance and low-cost load handling. Call your nearby Shaw-Box distributor.

1/8 TO 2 TONS

110 220 440 550	Volts AC. Only 24 volts at push buttons on the higher voltage models for extra safety.

AUTHORIZED SERVICE STATIONS from coast to coast save time, trouble, and money for every Budgit user.

60 A-1

MANNING MAXWELL & MOORE INC. MM&M TRADE MARK

BUDGIT ELECTRIC HOISTS

A Product of

MANNING, MAXWELL & MOORE, INC.

Shaw-Box Crane & Hoist Division • Muskegon, Michigan
In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

For more facts circle 536 on Reply Card

For more facts circle 535 on Reply Card

MAINTENANCE COSTS: ZERO

V-CORR by Bettinger ...the only roofing and siding protected with a ceramic skin!

When you sheathe an industrial building with V-Corr it serves you longer and costs you less. You never spend a nickel on painting. You simply forget about corrosion. Or rust-proofing. Or replacing weather-worn sections.

Tough, trouble-free V-Corr by Bettinger is corrugated sheet steel, *protected on both sides with a ceramic coating* permanently fused to the metal base. Its colors won't change. It's resistant to industrial fumes — gases — most corrosive chemicals. It's unaffected by salt air — moisture — steam. *It's completely non-combustible* — steel-strong — self-cleaning. You can cut it, drill it, stack-drill it, with ease.

V-Corr is made to last a lifetime. And not only does it stand up where non-protected and even most "protected" materials fail — it looks better, too!

V-Corr Ceramic Coated Roofing and Siding is an exclusive product of

THE BETTINGER CORPORATION

Milford, Massachusetts Toledo, Ohio

Write us for V-CORR BULLETIN 30 . . . filled with facts including installation methods and descriptions on flashings

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CORRECT LUBRICATION IN ACTION...IN AN EMERGENCY!

FROM DOUBLE DISASTER

ATCHISON DAILY GLOBE
Charles Kennedy, Who Died In Today's Flood, Was The Man Who Inspired The "Professor" So Often Quoted In This Line
DEVASTATING FLOOD HITS ATCHISON
10-Foot Wall Of Water Razes Buildings In Downtown Area; Two Perish; Loss In Millions
Torrent Follows Early Morning Storm; Traps Many In Their Homes
Atchison Will Rebuild
WATER DANGER!
Respond To Emergency
Mobilgas

Action shown here recalls the 1958 flood disasters in America's largest all-electric steel foundry operated by LFM Company, Atchison, Kansas. This division of Rockwell Manufacturing Company is one of the largest valve manufacturing plants in the world and a leader in steel-casting experimental work.

Mobil Correct

TO FULL PRODUCTION !

How Mobil helped LFM Company keep disaster costs to a minimum . . . return production to normal after two floods within three weeks.

ATCHISON, KANSAS; JULY 1958:

It couldn't happen—but it did! A second vicious flood only three weeks after one had ripped through the LFM Company's plant in Atchison, Kansas.

In both floods Mobil engineers speeded emergency aid, putting in 288 hours of voluntary service, working shoulder to shoulder with LFM personnel on many aspects of the disaster problem.

- Located and sent in portable pumps to flush out contaminated oil reservoirs.
- Trained people to flush, clean and rust-proof machines and parts.
- Prepared tanks for removing rust from corroded parts—by lining with wax, installing racks and filling with rust-removing acid.
- Obtained dispensing equipment to replace that missing.

As a result of this kind of help, 897 finished worms for motor driven valves were saved and delivered to the customer on time . . . saving LFM $36,000. In addition, 1705 gallons of oil were identified and reclaimed. Everything possible was done to protect machines and restore normal production.

This is Mobil Correct Lubrication in Action in an emergency! The remarkable cost-cutting lubrication program that's helping leading industries cut costs and improve profits. Why accept less for your plant?

SAVINGS *DURING NORMAL PRODUCTION THROUGH CORRECT LUBRICATION IN ACTION!*

Drill tapping speed increased . . . tool life extended 316%. Troublesome radial-drill tapping operation at LFM was studied by Mobil representative. He recommended use of a Mobil cutting fluid. This product increased number of holes tapped between tool changes by 316%. Tapping speed was increased 89%.

Storage problem solved—$11,388 saved. Storage of unmachined castings posed problem for LFM. Outdoor storage was desirable but castings rusted, had to be sandblasted before they could be finished. Mobil recommended rust preventive that eliminated sandblast . . . reduced handling time . . . saved $11,388.

MOBIL OIL COMPANY
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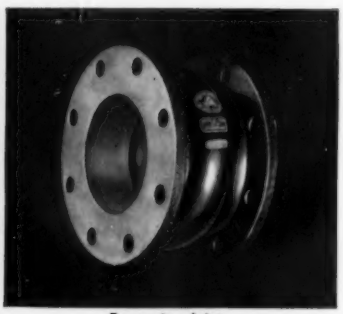
Lubrication

ENGINEERED PRODUCTS for Plant Maintenance

GUARDIAN Gaskets



Expansion Joints

CHEVRON Packing

ELIMINATE HOURS OF INSTALLATION AND MAINTENANCE TIME

Specify Garlock for sound in-plant service. You'll be amazed at how many dollars can be saved not only from solid, day-in day-out performance, but from the ease of application and the actual *lack* of maintenance needed on products like these:

Garlock GUARDIAN* Gaskets provide a safe, positive seal against high temperatures and pressures of steam, oils, gases, liquids. Gasket density, introduced during manufacture, assures dependable sealing under varying service conditions. Used at temperatures to 1050° F, pressures to 2500 psi . . . available in round, oval, square, flat side, diamond, pear and other shapes in practically any size. Large regional warehouse stocks are maintained at Camden, Cleveland, Houston, and San Francisco. Catalog AD-104.

Garlock All-Rubber Expansion Joints prevent noise and vibration in water and condensate lines. They react to the slightest pressure; this relieves any stress on expensive piping. Used against water, oil, mild acids, gases, and exhaust steam. Will withstand temperatures to +180 °F, pressures to 125 psi. Garlock has Rubber Expansion Joints ¾″ to 84″ in dia.; in round, rectangular, tapered, and offset spool types or U types. Catalog AD-137.

Garlock CHEVRON* Packings assure positive, low friction sealing on rams, plungers, reciprocating rods. Designed to tighten as pressures increase, ease off as pressures lessen . . . this means minimum friction at all pressures. Available in many materials for temperatures ranging from −320° F to +600° F. Catalog AD-115.

For more information, contact the nearest of Garlock's 26 sales offices

GARLOCK

and warehouses throughout the U.S. and Canada. Or, write for catalogs. The Garlock Packing Company, Palmyra, New York.

Canadian Div.: The Garlock Packing Company of Canada Ltd.

Plastics Div.: United States Gasket Company

Order from the Garlock 2,000 . . . two thousand different styles of Packings, Gaskets, Seals, Molded & Extruded Rubber, Plastic Products

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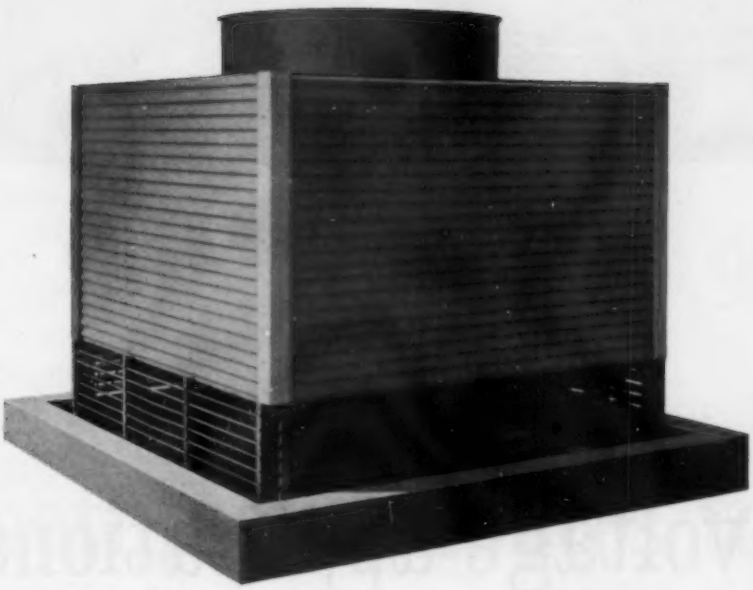
FLUOR COOLING TOWERS



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lower maintenance cost

built-in permanence

etc.*

* The et ceteras make profitable reading. Would you like a free copy of our catalog that describes in detail the designed quality of Fluor towers?

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INDUSTRIAL COOLING TOWERS

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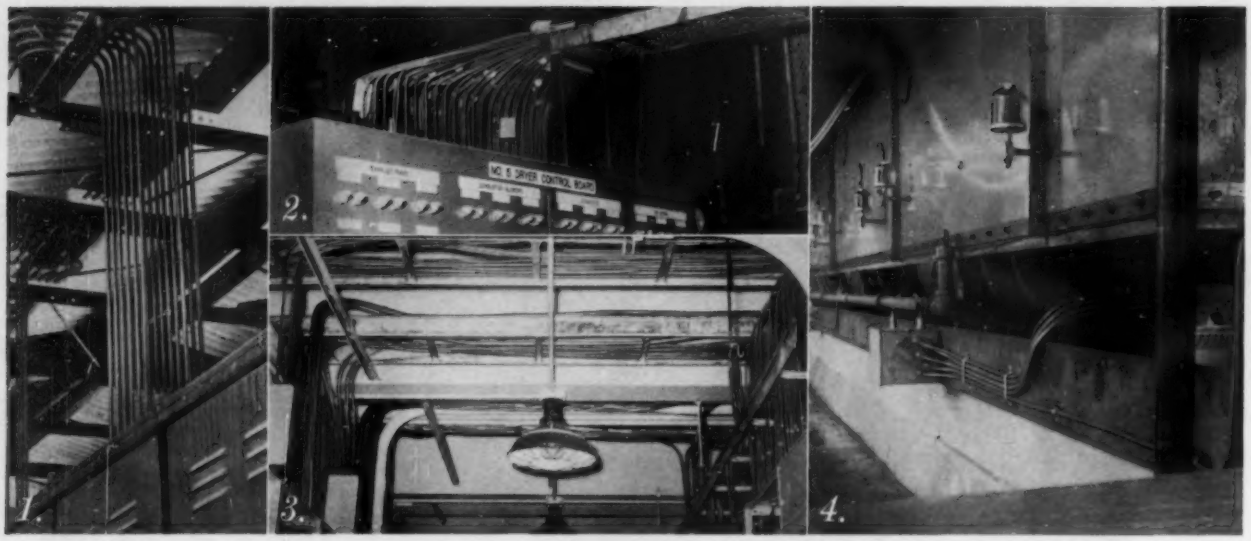

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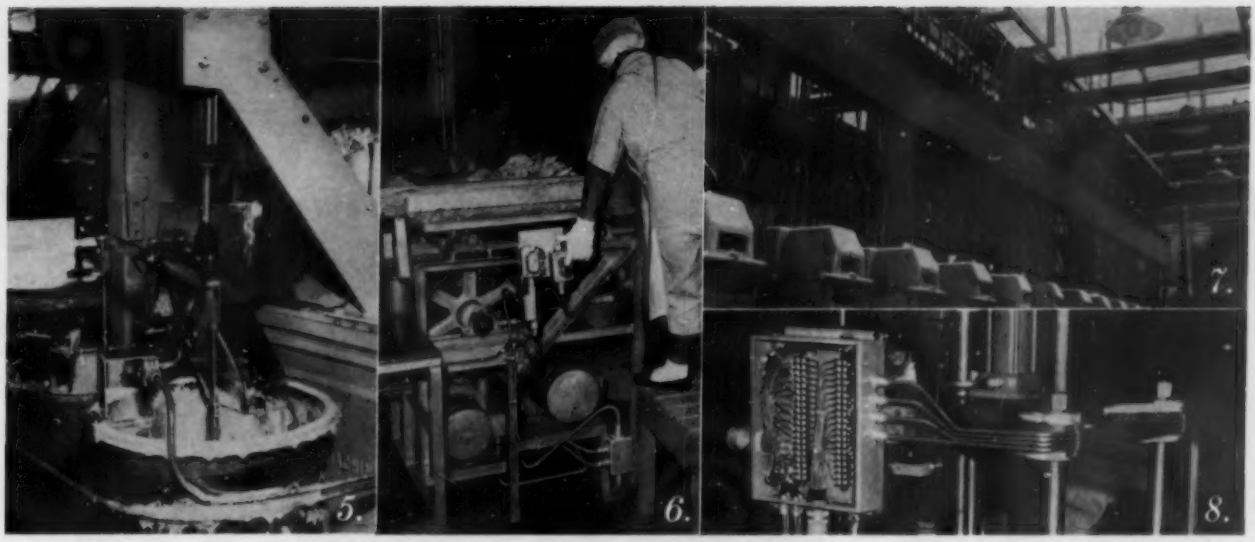
MI installed in 1. Oil refinery 2. Chemical plant 3. Dairy 4. Printing press 5. Pineapple cannery 6. Tuna packing plant 7. Oil refinery 8. Automotive plant



nothing compares to the safety, of Mineral Insulated (MI) Cable.

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OPERATION AND PRODUCTION —pointers for the industrial plant engineer

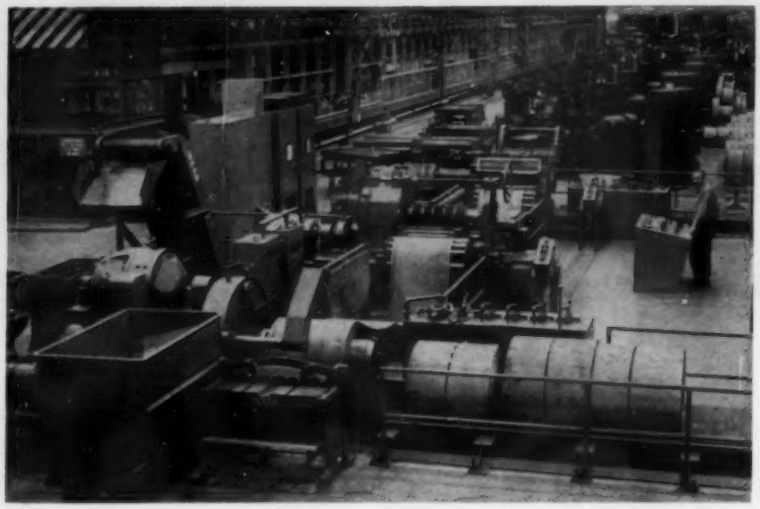
Edited by Vern Kempf

Double-Loop Line Overcomes the Handling and Production Problems of Slitting Silicon Steel

ADVANTAGES of purchasing standard width coils are often offset by the difficulty of slitting silicon steel coils without destroying electrical properties of the metal. This problem has been overcome at the Westinghouse Electric Corporation plant at Athens, Georgia, by the installation of a specially designed Wean slitting line.

Developed jointly by engineers from Westinghouse and the Wean Equipment Corporation, the line has a number of special features designed to insure efficient handling of the metal at every stage of the slitting operation. As the steel uncoils, it feeds into a loop and is pulled into the slitter by driven arbors.

As the slit strands leave the slitter they feed into a second loop before entering the recoiling equipment. This procedure differs from the usual carbon steel slitter where tension is maintained on the strip from the recoiler back to the uncoiler.



Double-loop line relieves tension on strip to slit silicon steel without destroying important electrical properties. The uncoiler, slitter and recoiler are all motorized.

In this loop-type line, the slitting knives are driven constantly whereas in a tension-type line, they may or may not be driven. The entry and exit loops are necessary to isolate the slitter from any tension of other equipment on the line.

Special Testing Equipment Checks Tensile Strength of Crimped Wire Terminals

TENSILE strength requirements for solderless electrical connections vary almost as widely as the equipment in which they are used. Tensile capabilities not only vary between one type of crimped connector and another but among similar connectors, depending upon the type and size of the wire and its insulation and the geometry of the crimp itself.

Compact pull tester checks solderless wire connectors for tensile strength.

Malco Manufacuring Company, Chicago, Ill., make a variety of crimped connectors and solderless terminals. Although most of these terminals and connectors are of standard designs, the tensile strength of the joint between a particular connector and the wire to which it is crimped often varies widely from one application to another.

As a large step towards solving this problem, Malco engineers are now using a tensile tester designed to test the strength of solderless electrical connectors. Called the Hunter Terminal Pull Tester, the unit consists of a precision force gage and an air motor mounted on a common base.

A special turret head is mounted on the gage to accept a variety of common wire sizes. The connector is hooked in the appropriate notch in the turret. Extending from the air motor is a jaw-type clamp which grips the free end of the wire. Pressing a button operates the compressed air motor, closing the jaws and pulling the wire until the crimped connection fails.

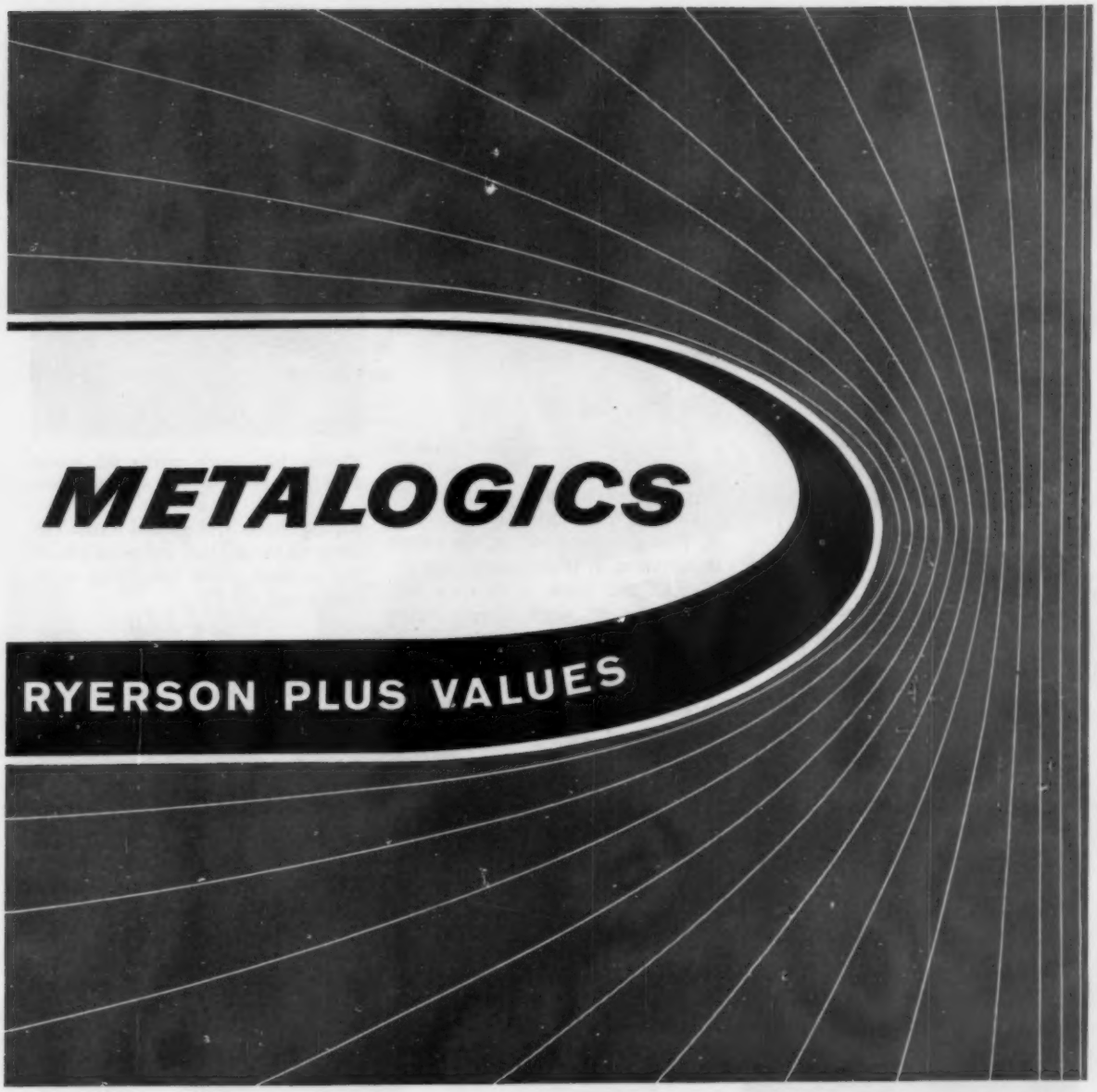
For easy reading the gage holds the maximum reading, showing the force of the pull at failure, until it is reset with a button. An adjustable hydraulic speed control can be set to provide the desired rate of pull.

Testers are available from the Hunter Spring Company, a Division of American Machine and Metals, Inc., Lansdale, Pa. Required compressed air operating pressure is one-fifth the maximum force gage dial reading.

Inspects Rivets Electronically

DEVELOPED by electrodynamics staff engineers at the Boeing Airplane Company Transport Division,

(Continued on page 68)



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For more facts circle 542 on Reply Card

OPERATION — PRODUCTION

(O and P begins on page 66)

Electronic rivet head inspection device reduces inspection time by two-thirds.

an electronic rivet head inspection device provides increased accuracy and reduces inspection time by two-thirds over former hand-gaging methods. The gage indicates to 0.0001 in. deviations from standard in inspection samples of the hundred million or so rivets Boeing buys each year.

From a batch of 50, taken at random, each rivet is measured individually and the device will come up with a figure, automatically averaged and computed, governing acceptance or rejection for some 332 categories of rivets. The electronic and electro-mechanical principles utilized are expected to be applied to a number of other gaging operations.

Automatic rivet handling and an improved computer, now in design stages, are expected to further increase the time savings.

Lube Truck Has Everything

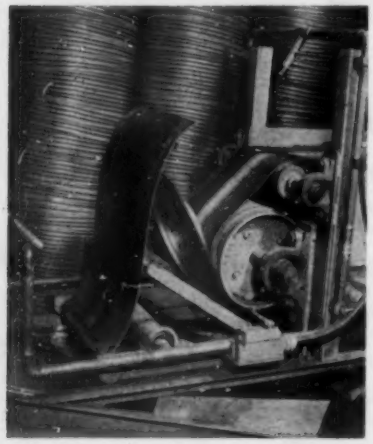
LUBRICANTS for machine tools in four shops at Allis-Chalmers West Allis Works are being supplied by means of this electric truck devised by Ray Chatman of the lubrication department. It is estimated that the new electric truck saves over 500 man-hours of work a year when compared to the previous hand unit.

This truck not only provides faster service than the hand truck it supplants but it accommodates some 70 gallons of lubricants, nearly three times the quantity previously handled. The truck has six pumps, a shelf for oil cans, and hangers for grease guns. A cabinet mounted on the rear holds lubrication forms, wiping cloths and special tools. The cover of the cabinet serves as a writing surface when recording work completed.

Electric lube truck carries oil, grease guns and tools in one compact unit.

Magnetic Pulley Turns Lids, Eliminates Manual Handling

AUTOMATIC lid turners, installed at Inland Steel Container Division plant in Jersey City, N. J., help save on labor costs by eliminating manual turning of each lid. Fleetwood Systems of La Grange, Ill., designed and installed the conveying systems which turn the covers over so the reverse sides can be lacquered.



Permanent magnetic pulley holds each lid until it is turned upside down, then drops it onto the lower conveyor belt.

To accomplish this turnover, an Eriez permanent magnetic pulley is used at one end of the conveyor belt. The flow of covers, as shown in the photograph, is right to left. The magnetic pulley holds the covers as they come down around the end of the conveyor belt and start traveling under the machine. As soon as the covers clear the magnetic pulley, they drop in an inverted position to the second belt, below, which conveys them to the lacquering station.

When required, the standing metal plate can be moved down near the upper belt to create a bypass so that the lids do not turn over when coating is required only on one side.

Vinyl Coating Protects Tanks

RUGGED climatic conditions presented a tough problem in protection and maintenance of three new fuel oil tanks erected to feed steam generators at the Scattergood Steam Plant, Los Angeles, California. With a capacity of 8,000,000 gallons each, the steel tanks are subject to rain, hot coastal sun, smog and salt-laden air. Even before the tanks were completely assembled, their steel plates began to rust.

Both the immediate corrosion problem and that of long term maintenance were solved by applying a sprayed-on plastic protective coating system. The system consists of three different vinyl resin coating formulations, applied in a four-coat process. Total thickness of the combined coating is a minimum of 8 mils. The plastic protective system was engineered and supplied by Surface Engineering Co., Inc., Wichita, Kansas.

Steel plates were sandblasted to remove accumulated rust and the first coat, a pigmented primer for use on metal surfaces, was applied immediately. This procedure prevented new rust deposits from forming before subsequent coatings could be applied.

This prime coat was followed by two coats of a Hi-Build vinyl coating. The final coat consisted of a

STANDARD HOSES

LOW PRESSURE	H-9 SAE 30R2	H-100 COTTON COVERED
MEDIUM PRESSURE	H-17 SAE 100R3	
HIGH PRESSURE	H-25 SAE 100R2	
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Spiral Wire Reinforced

REUSABLE ENDS

STEEL

STANDARD 2-PC. END

For fast assembly and positive, leakproof connections. Designed for dependable performance under high pressure. Skive and no-skive.

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For most two-wire braid high-pressure hydraulic hose applications. No skiving of hose or special tools required.

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Fast, easy push-on, stay-on hose ends for all types of low pressure applications. Sizes ¼" to ¾" I.D. Rugged and durable.

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Swaged or crimped permanently attached hose ends. Any quantity, any size, any type. ⅛" to 2". For all working pressures.

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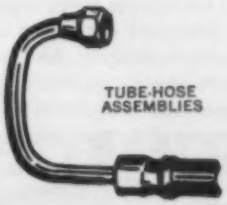

TUBE-HOSE ASSEMBLIES

THE WEATHERHEAD COMPANY

FORT WAYNE DIVISION • Dept. PL-3, 120 W. Washington Blvd., Fort Wayne, Ind.
In Canada: The Weatherhead Co., Ltd., St. Thomas, Ont.

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Realistic plant engineers recognize that, for design and construction of specialized equipment like this, it's good sense to rely on a qualified outside source.

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Standard engineers will be glad to consult with you and offer recommendations. And whether the solution is a small power pack or a million dollar, multi-building installation, Standard has the skills, experience and facilities to design and produce—completely—the equipment to meet your requirements.

STANDARD

Request Catalog No. 247 describing Standard industrial panels and consoles.

THE STANDARD ELECTRIC TIME CO.

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For more facts circle 544 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 66)

third vinyl formula which acts as a seal coat giving the fuel tanks a gloss finish. The plastic coating, based on vinyl resins produced by Union Carbide Plastics Company, Division of Union Carbide Corporation, has an anticipated life of 8 to 10 years.

Channels Speed Up Flooring Job

A SMOOTH, strong floor formed of channels was installed rapidly with reduced cost and weight at the Janesville, Wis., assembly plant of the Chevrolet Division of General Motors Corporation. Approximately 17,000 sq ft were covered with 20-ft lengths of 12-in. Junior Channels produced by Jones & Laughlin Steel Corporation.

Additional space required for the

Twelve-inch wide channels were rapidly set in place to form a strong floor.

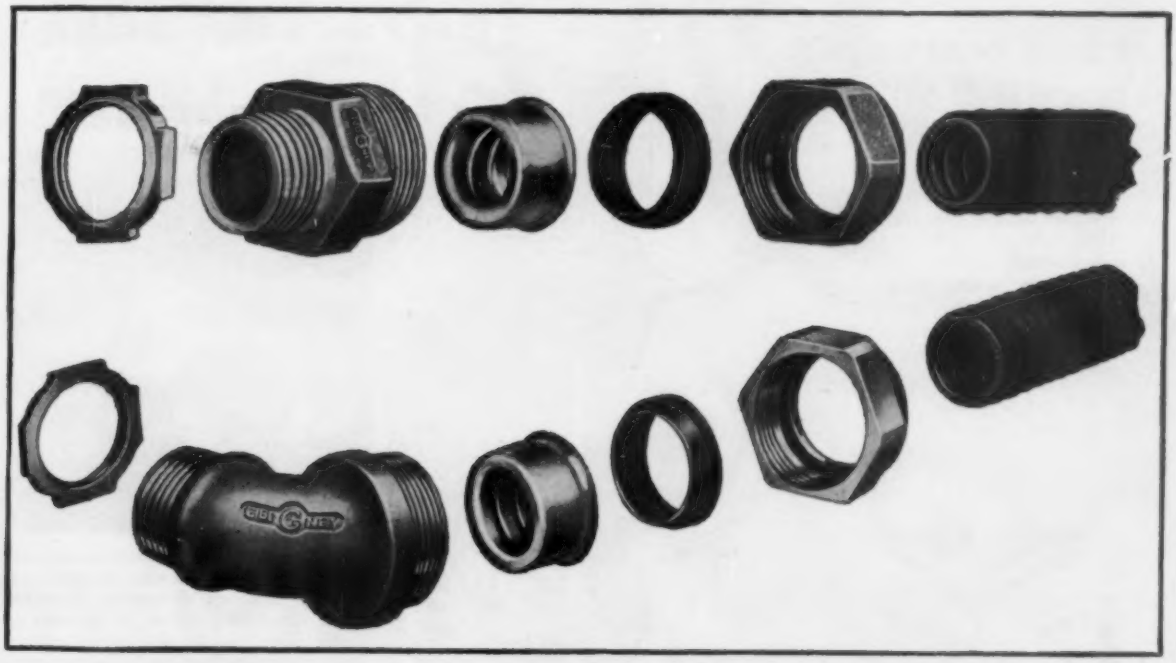
storage of automobile bodies was acquired by the erection of a second story over a wing of the assembly plant. It was important to erect this steel without interruption to plant operations. Because the channels were placed in long lengths, the floor was laid at low cost and completed rapidly.

Extensive welding and placement of stiffeners needed with the usual steel plate floor was eliminated by the channel construction. Weight of the finished floor is less than a comparable ¼-in. plate floor.

The supporting frame for the

For absolutely Liquid-Tite Connectors specify

GEDNEY— every time!



THESE ARE THE NEWEST, most efficient liquid-tite connectors available today for use with Sealtite* and equivalent liquid-tite conduits. Designed to give wiring installations absolutely dependable protection in these popular oil- and water-tight flexible raceways, Gedney Liquid-Tite Connectors are built for lifetime service.

As shown from left to right in the exploded views above, Gedney Liquid-Tite Connectors consist of:

1. **Locknut—nut stock steel—cadmium-plated**
2. **Main Fitting—straight, 90° angle, or 45° angle—malleable iron—cadmium-plated**
3. **Grounding Bushing—one piece—threaded to engage conduit spiral**
4. **Molded Vinylite sealing ring—pliable—ever-lasting**
5. **Gland Nut—malleable iron—cadmium-plated**

Standard sizes range from ⅛" to 2" straight, 45° and 90° . . . order Gedney Liquid-Tite Connectors for top safety and longest life.

* *Sealtite is the trade name of American Metal Hose Branch of the American Brass Company*

GEDNEY FITTINGS FIT!

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GEDNEY

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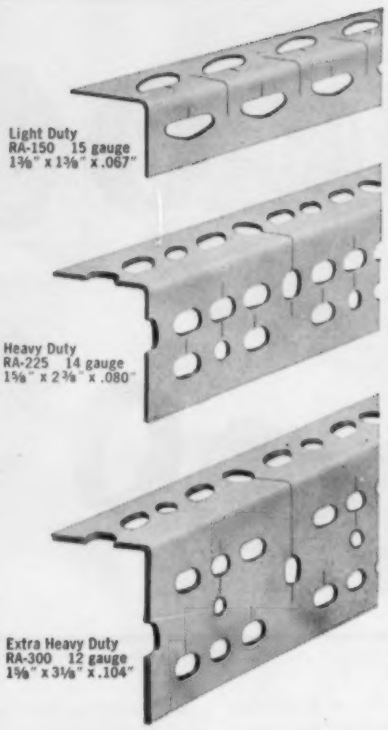
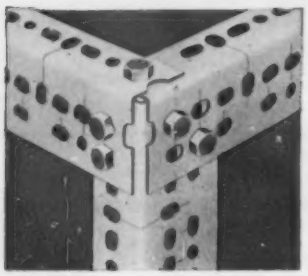
NEW! STEEL CITY SLOTTED ANGLE in 3 sizes

A Size, Weight and Strength for EVERY Job!

Steel City's RIGHT ANGLE* is fabricated in three sizes for maximum economy and utility . . . all sizes interchangeable within the same structure. The exclusive slot-and-hole pattern, recurring every three inches, provides the erector with a rigid method of securing joints. RIGHT ANGLE is structural quality steel, electro-galvanized *after* processing for complete protection.

*trade name





The RIGHT ANGLE method of forming a corner assures both ease of assembly and rigidity. A wrench is the only tool needed for erection.

"One-Man Carry" Packages

Catalog Number	Length	Package	Package Weight
RA-150	6′	10	35
RA-225-10	10′	5	48
RA-225-12	12′	5	56
RA-300-10	10′	5	72
RA-300-12	12′	5	84

Sixty ⅝" structural bolts and nuts included with RA-150. Thirty-six ⅜" bolts and nuts with each package of RA-225 and RA-300.

The specially designed portable Steel City Cutter cuts all three sizes of RIGHT ANGLE cleanly with one easy stroke.

Measure and cut marks every ¾"

Sold through wholesale distribution only!

Write for bulletin RA-1 or see our catalog in Sweet's files

STEEL CITY ELECTRIC COMPANY
A Subsidiary of American-Marietta Company
PITTSBURGH 33, PA.

For more facts circle 546 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 66)

floor was spaced on six-foot centers, thus utilizing the full capacity of the channels on their weak axis to carry the live load. At points of contact, the channels and supporting frame were joined with three-inch welds.

Counter Detects Radiation

Palm-sized alpha survey instrument containing tiny new detectors, developed by Hughes Aircraft Company, provides rapid visual information on amount of alpha radiation in any environment. Detector can be used for industrial safety to count radiation more effectively.

Toggle Clamp Makes Simple Press

USING standard steel sections and a $19.00 plunger-type toggle clamp, B/W Controller Corporation, Birmingham, Michigan, made a simple punch press. It has eliminated the drilling and de-burring operations formerly required for making mounting holes in relay cases. The press also helped in cutting production time on a particular lot of relay cases from eight hours to one hour.

In building the hand press, a handle extension and support braces were welded on the toggle clamp handle and this was mounted on a steel block supported on short columns. The required punch is screwed on the plunger and the die button is mounted in the locator block. The locator block serves as a platen to support the relay case edges.

Although the toggle clamp, manufactured by the Detroit Stamping Company, has a rated holding pressure of 4000 lb, the calculated force

TEST MACHINE at a metal fabrication plant gets air from the Le Roi 100S2 shown below. Unit also supplies air for presses, automatic and manual welders, painting machines, and automatic assembly machines.

puts your plant air supply right where you need it!

LE ROI 100-HP STATIONARY COMPRESSOR

Trouble-free air-cooled LeRoi 100S2 delivers 450 cfm of air at 125 psi — yet takes up only 20 sq. ft. of floor space.

Any way you look at it, the Le Roi 100S2 two-stage stationary compressor is your best bet to lower your cost of compressed air.

It provides cool, clean airpower. And its compactness permits installation *near the point of use,* thus eliminating excess piping and costly waste of air. If you need more air, you just install more Le Roi S2 compressors — and you can still beat the cost of centralized air systems.

The electric-motor-driven 100S2 is easy to operate and maintain. Its Dual-Control permits either constant-speed or automatic start-and-stop operation. Air cooling eliminates plumbing and water line freeze-ups . . . permits indoor or outdoor installation. Balanced design reduces vibration and noise . . . extends compressor and motor life.

Put your compressed air system on a paying basis. Investigate the complete Le Roi line of unit-type and stationary air compressors — from ½ to 100 hp. Contact your Le Roi distributor, or write to Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wisconsin. 2C-05

LE ROI STATIONARY COMPRESSORS

PORTABLE AND TRACTAIR® AIR COMPRESSORS • STATIONARY AIR COMPRESSORS • AIR TOOLS

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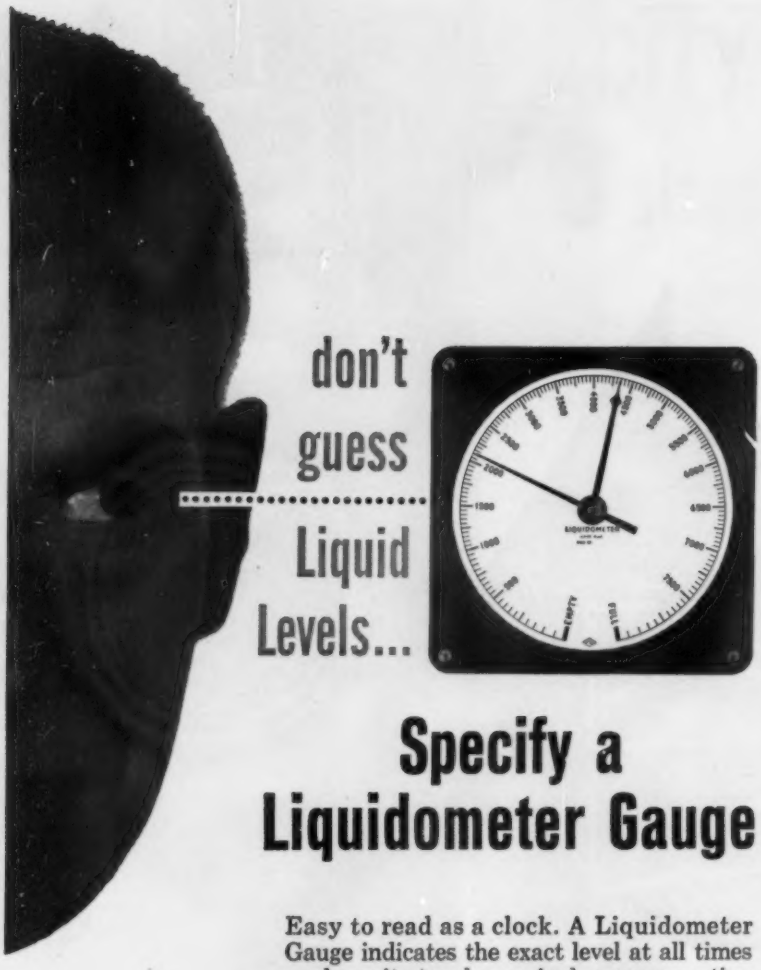

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Specify a Liquidometer Gauge

Easy to read as a clock. A Liquidometer Gauge indicates the exact level at all times ...shows it at a glance. And gauge operation is completely automatic—as far as 250 feet from the tank—without need for auxiliary power of any kind.

A Liquidometer Tank Gauge measures virtually any liquid. It's simple to install—requires no maintenance. Many have provided over 30 years of efficient, dependable service. All are approved by Underwriters' Laboratories and Factory Mutual.

Whether your gauging needs require an automatic Liquidometer Gauge, a hydrostatic Levelometer or a tank-site-indicating Direct Reader, you'll get the best by specifying Liquidometer. For complete details write Dept. B.

Since 1920 ...of proven quality

THE LIQUIDOMETER CORP.

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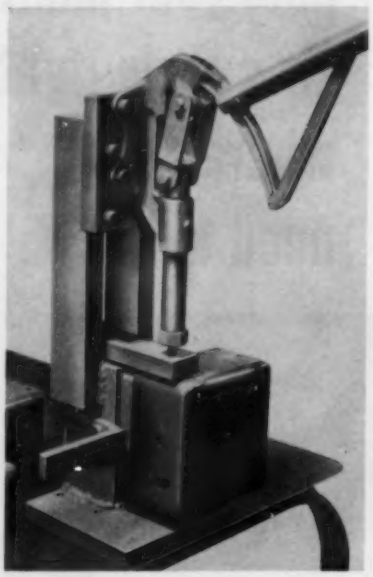
OPERATION—PRODUCTION

(O and P begins on page 66)



Standard steel sections and a $19.00 clamp make this shop-made toggle press.

generated in piercing the holes exceeds 5000 lb. The whole unit is light enough to be carried around to different locations as required. To keep the handle extensions from protuding when the press is not in use, a heavy spring is slipped over the punch. This keeps the handle in the raised position.

No Throat Limits on This Drill

DRILLING 150 to 200 holes in ebony asbestos and steel switchboard panels too large for the

Overhead drill press solves the problem of drilling holes in large panels.

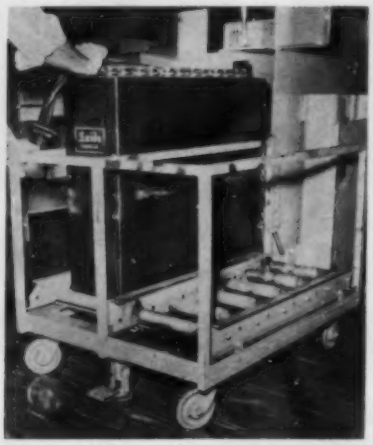
throat capacity of a conventional drill press was a problem at Electric Box and Switchboard Company, Chicago. Installation of a standard Delta overhead drill press solved the problem and now panels up to 40 by 72 in. are drilled without any difficulty.

Mounted on a 40-in. track, the tool can reach to any point within 10 in. of either side of the track. Because there is no column to interfere with positioning, the work may be moved to give the drill press unlimited capacity. The table on which the work rests is equipped with casters to facilitate positioning.

Previously panels were drilled with a column-mounted machine which required constant turning of the work piece.

Cart Simplifies Battery Changes

UTILIZING twin roller conveyor sections, a special battery handling truck simplifies installation and removal of Exide batteries from



Batteries are moved from electric truck compartment to cart with little effort.

electric industrial trucks at the International Business Machines Corporation's General Products Division plant, San Jose, California. Deck height of the cart is same height as truck battery compartment, allowing smooth transition without lifting.

Fabricated to IBM specifications, the cart aids removal and switching of batteries in truck compartments; provides simple means for transporting batteries; and serves as a workstand for maintenance and repair work on batteries. Steel rails on the cart prevent the battery from rolling too far.

Spotless boiler room with fully modulated CB boilers has been termed by visitors "the most beautiful we've ever seen." Stress is on automatic operation from winter heating to summer cooling.

MODERN as the buildings they heat . . .

Two compact, efficient, automatic CB boilers heat five new buildings for International Minerals and Chemical Corporation

Precision and quality are a must for this company which produces minerals and chemicals for industry and agriculture. It's an attitude that carries over to the equipment they buy. That's why they installed two 100-hp Cleaver-Brooks boilers to heat their dramatic new headquarters at Skokie, Ill.

According to Callix E. Miller, A.I.A. Project Manager for IMC, "Our Cleaver-Brooks automatic packaged boilers are efficient and quiet." He added, "Their styling and performance are in keeping with functional design that characterizes our new headquarters."

W. J. Mullineaux, Plant Engineer, reports, "Cleaver-Brooks four-pass, forced-draft design has proved it can keep our operating costs low. The CB boilers fit in well with the automatic system we have and simplify our entire operation. Hinged doors make routine inspection easy."

Architects and Engineers on the job were Perkins and Will. Builder was Turner Construction Company.

For complete information on Cleaver-Brooks packaged boilers like those installed at IMC, contact your representative or write direct to Cleaver-Brooks Co., Dept. C, 364 E. Keefe Ave., Milwaukee 12, Wisconsin, U. S. A.

Cleaver Brooks

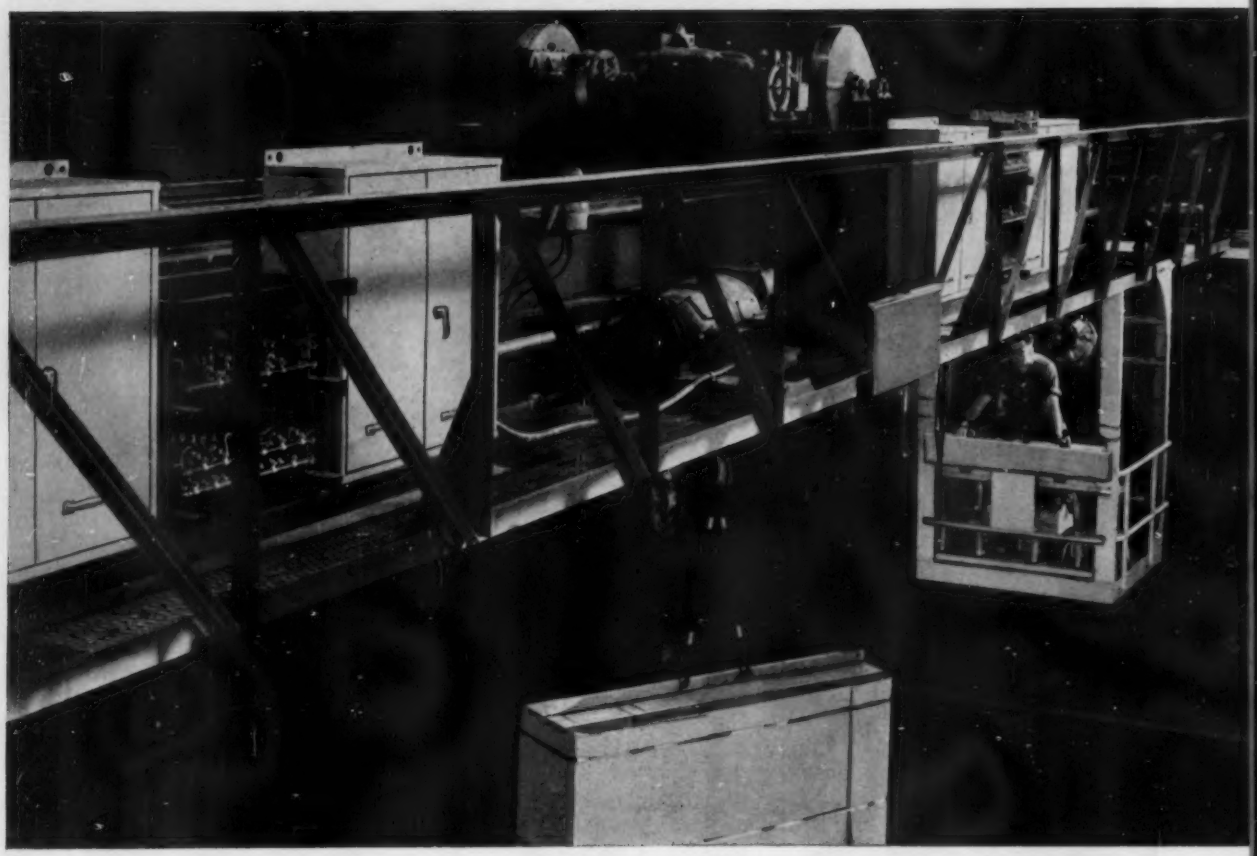
ORIGINATOR AND LARGEST PRODUCER OF PACKAGED BOILERS

IMC headquarters buildings that are heated by CB boilers include the operations building and annex, administrative building, and employees' lounge-cafeteria.

For more facts circle 549 on Reply Card

With General Electric's Complete "7400 Line"

GET STEPLESS



Now you can have *completely* stepless crane control —from full-speed lowering to full-speed hoisting— plus extremely accurate spotting. And this is just part of the story on General Electric's new "7400 Line." You also get substantially reduced maintenance: static devices are used in the control circuit to eliminate secondary contactors, relays and other moving-part components. Once energized, the IC7406 control can be operated through an entire hoisting and lowering cycle without a single control-panel component moving!

The "spotting zone" illustrated on the performance characteristic chart above is the operating area where accurate handling of valuable loads is most important. And this is where General Electric's IC7406 control really pays off! You can stop, momentarily hold, or reverse the load at "creeping" speed—without jogging!

General Electric's complete line of a-c crane controls also includes regulated and non-regulated control, both utilizing static components. Get the full story on the G-E "7400 Line" by contacting your G-E Apparatus Sales Office, or mail the coupon today!

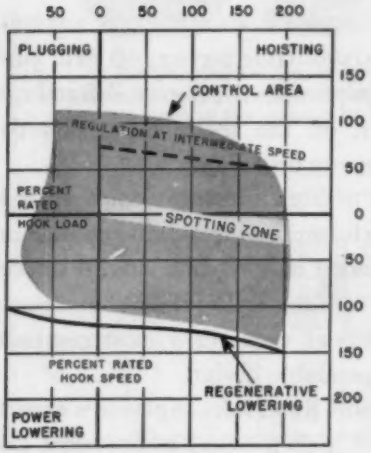
Progress Is Our Most Important Product

GENERAL ELECTRIC

of AC Reactor Crane Controls You Can . . .

SPEED CONTROL

COMPARE THE PERFORMANCE AND FEATURES OF GENERAL ELECTRIC'S AC CRANE CONTROL



PERFORMANCE CHARACTERISTICS of General Electric's IC7406 static crane control.

COMPARE THESE FEATURES:	G-E IC7406	"A"	"B"	"C"
Reverses statically with no moving parts	✓		✓	
All magnetic components—no electronic tubes	✓		✓	✓
Balanced motor currents	✓	✓		
"Spotting zone" control for accurate positioning	✓			
Control from one master switch	✓	✓		✓
Completely stepless control	✓			
Total number of power contactors	1	2	3	8
Total number of relays (excluding overload relays)	2	4	6	13
Eliminates secondary accelerating contactors and relays	✓	✓		
Eliminates need for both electrical and mechanical load brakes	✓		✓	✓
Trolley collectors required	9	10	10	10
Flat speed-torque characteristic on *all* master switch positions	✓			

NEW TRI-CLAD® WOUND ROTOR MOTOR

General Electric's new Tri/Clad "55" wound rotor motor now makes it possible to substantially cut motor and control costs on crane applications.

Up to 59% smaller and 49% lighter, this new motor development packs more horsepower into a given frame size than any standard Class-A insulated wound rotor motor available. And—lower secondary currents reduce control equipment costs.

These motors are available in ratings from 5 to 150 horsepower in dripproof, TENV or TEFC enclosures. G.E.'s new convertible design allows increased flexibility and reduced warehousing costs. Type MR dripproof motors may be converted to TENV motors simply by adding endshield covers and changing the pulley endshield.

®Registered Trade-mark of General Electric Company.

MAIL THIS COUPON TODAY

Sect. H785-11
General Electric Company
Schenectady 5, N. Y.

Please send me full information on General Electric's new "7400 Line" of AC crane controls, and new Tri/Clad wound rotor motor.

Name_____

Company_____

Street_____

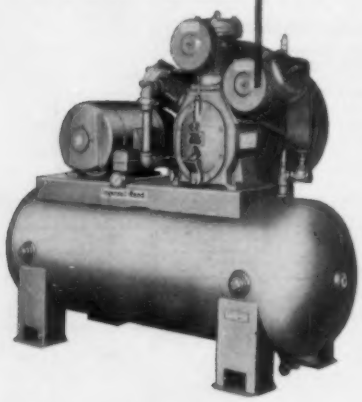
City_____

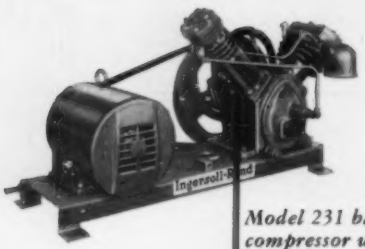
State_____

high pressure COMPRESSED AIR

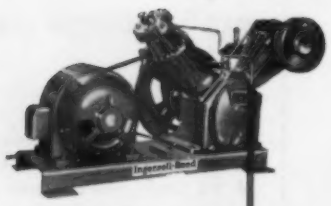
...in small quantities from small air-cooled compressors

Model H15TE tank mounted compressor will deliver air at 250 psig pressure.





Model 231 baseplate mounted compressor will deliver air at 500 psig pressure.



Model 41 baseplate mounted compressor will deliver air at 1000 psig pressure.

1½ through 25 horsepower
250 to 5000 psig pressure

For air blast circuit breaking, air starting of engines, valve test stands, accumulator service, oil field rigs, air craft support equipment, etc., Ingersoll-Rand can supply compressors, off the shelf, specifically designed for high pressure operations.

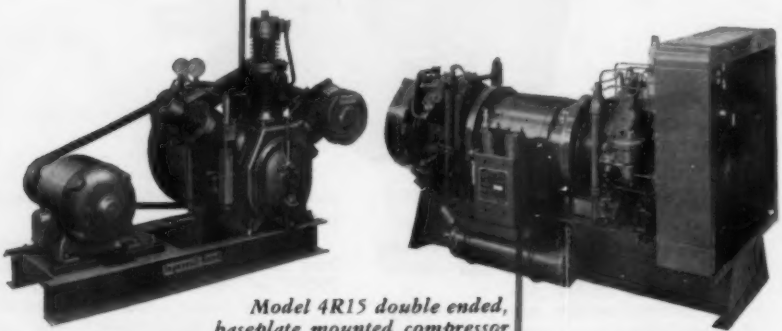
Proper selection of high pressure compressors is important. Duty cycle, minimum and maximum running time and intended maintenance are all important factors. Ingersoll-Rand makes these compressors to give you exceptional value in a most compact, economical and dependable design.

Your local Ingersoll-Rand sales engineer is experienced in the field of high pressure compressors and is prepared to assist you in choosing the proper compressor for your application. See him today or write to—

Ingersoll-Rand

85A3 **11 Broadway, New York 4, N. Y.**

Model 15T3 baseplate mounted compressor will deliver air at 3000 psig pressure.



Model 4R15 double ended, baseplate mounted compressor will deliver air at 5000 psig pressure.

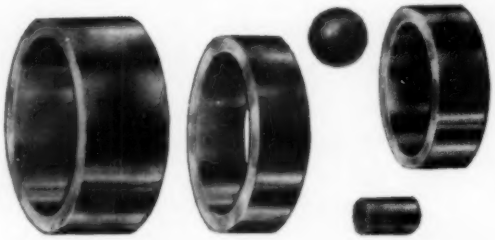
OTHER I-R HIGH PRESSURE COMPRESSORS TO 7500 HP-PRESSURES TO 35000 PSIG

For more facts circle 551 on Reply Card

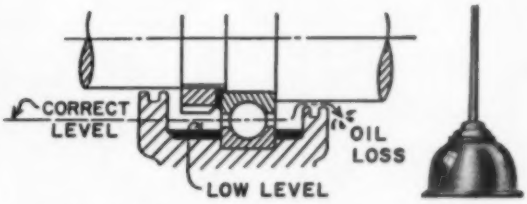
DISTRIBUTOR DAN, the SKF bearing man, tells

WHY BEARINGS BECOME OVERHEATED

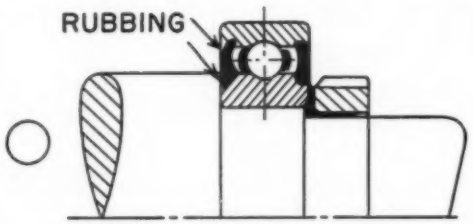
and how to correct the conditions that cause excessive heat.



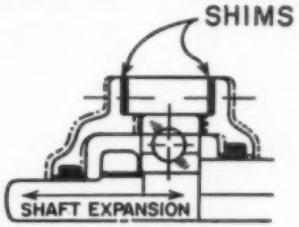
LOOK FOR THIS SYMPTOM. Discoloration of a bearing's rings, balls or rollers is a sure sign of overheating. The color is usually a gun-metal blue or bluish black.



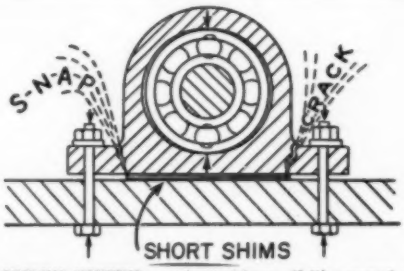
IMPROPER LUBRICATION OR LUBRICANT accounts for most cases of overheating. In pillow blocks, if oil is specified, fill only to the center of the lowest ball or roller in the bearing. If it's grease, the lower half of the pillow block should be filled. Therefore, be sure you're using the right lubricant—**in the proper quantity.**



RUBBING is a frequent culprit. Check the running clearance of the bearing seal. If it rubs against the shaft shoulder, remachine the shoulder, to allow proper clearance. Bent lockwasher prongs are sometimes to blame. Straighten them or replace the washer.



EXTERNAL HEAT, conducted through the shaft, can make an inner ring expand excessively. It's usually the result of using a bearing with inadequate internal clearance. Make sure the replacement bearing is exactly the same as the original bearing. Should the markings be indistinct, consult an **Authorized SKF Distributor.**



THE BEARING HOUSING may be to blame—if it's warped or if the bore is distorted and out-of-round. Check to see whether the bore is pinching the bearing and relieve by scraping the bore. Make sure, too, that the pedestal surface is flat and that any shims cover the entire base area.

Baffled by a bearing problem? Whether it's selection, mounting, or maintenance—consult your Authorized SKF Distributor. He's staffed to help you keep them running smoothly and he stocks all the bearing types and sizes you need.

SKF

AUTHORIZED DISTRIBUTOR

Spherical, Cylindrical, Ball, "Tyson" Tapered and REED Miniature Bearings

EVERY TYPE—EVERY USE

SKF®

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

®REG. U. S. PAT. OFF.

For more facts circle 552 on Reply Card

For more facts circle 553 on Reply Card →

Yale tractor shovels

are setting new performance standards wherever they are used. Compare Yale power against any other in its field. Only Yale gives you a torque converter and fully automatic transmission with a 72-hp. 6-cylinder engine. Compare Yale action! 2500-lb. carry capacity bucket. Exclusive 45° bucket tipback for faster loading and minimum spillage. 6 ft. dumping clearance–highest in the field. Compare Yale safety! Safety-curve lifting members never rise alongside the operator. Front and rear working lights for additional security. Compare Yale design! Rugged, simplified, more efficient. Brakes and electrical system sealed. 10-ply tires. Many parts interchangeable with Yale Gas trucks. Compare these features with a demonstration in your own plant. See why you'll save time and money.

For full information, or a demonstration, call your Yale representative, or send for free brochure #5255A to The Yale & Towne Mfg. Co., Materials Handling Div., Phila. 15, Pa., Dept. YT-4.

Yale Materials Handling Division, a Division of The Yale & Towne Manufacturing Company. Manufacturing Plants: Philadelphia, Pa., San Leandro, Calif., Forrest City, Ark. Products: Gasoline, Electric, Diesel and LP-Gas Industrial Lift Trucks Worksavers · Warehousers · Hand Trucks · Industrial Tractor Shovels Hand, Air and Electric Hoists.

YALE®

INDUSTRIAL LIFT TRUCKS
TRACTOR SHOVELS · HOISTS

YALE & TOWNE

This illustration suitable for framing, available upon request

BUFFALO BUILDS THE FAN FOR THE JOB

BLOWING • EXHAUSTING

FOR PRESSURIZED AIR APPLICATIONS Buffalo Type "E" Blowers are compact, husky units in 5 sizes up to 5500 cfm, for constant pressures up to 2 lbs., on direct-connected applications such as:

- Oil or gas furnace blowing
- Cupola blowing
- Gas line boosting
- Exhausting from grinding wheels
- A quality unit to put on equipment you sell.

A number of these efficient motor-driven units can provide power and installation savings over one large blower — plus flexibility of operation. For full details, write for Bulletin FM-900.

FOR EXHAUSTING AIR OR MATERIALS Buffalo Industrial Exhausters are ruggedly built to handle the most punishing air or materials handling jobs. Their heavy steel plate housing is welded throughout. Wheels and blades are all-welded. Available in designs with heat slinger for moving hot gases (200° to 850° F.) — for handling corrosive fumes — or for moving abrasive or stringy materials such as emery dust, chips and shavings. Write for Bulletin FI-110 or consult your nearby Buffalo Engineering Representative about the complete line of Buffalo Fans for every air job in industry.

BUFFALO FORGE COMPANY BUFFALO, NEW YORK

Buffalo Pumps Division • Buffalo, N. Y.

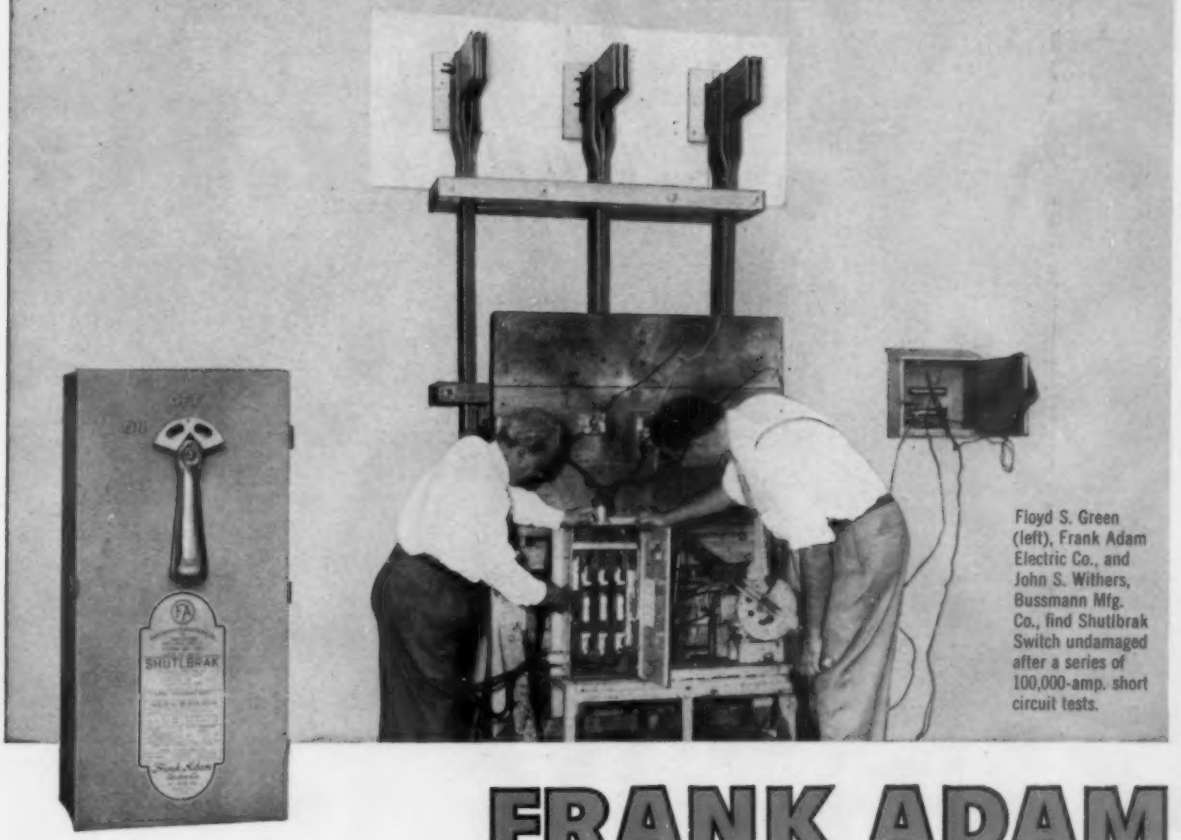
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo"

VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT • EXHAUSTING • FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING

For more facts circle 554 on Reply Card

UNDAMAGED AFTER BEING "CLOSED" ON 100,000-AMPERE SHORT CIRCUIT!



Floyd S. Green (left), Frank Adam Electric Co., and John S. Withers, Bussmann Mfg. Co., find Shutlbrak Switch undamaged after a series of 100,000-amp. short circuit tests.

FRANK ADAM SHUTLBRAK SWITCHES

(SHUTTLE BREAK)

TYPICAL TESTS MADE WITH Ⓕ 3-POLE SHUTLBRAK SWITCHES

Switch Capacity	Fuse Type
100-amp. 250-v. Same switch	KTN Limitron LPN Low Peak
200-amp. 250-v. Same switch	KTN Limitron LPN Low Peak
100-amp. 600-v. Same switch	KTS Limitron LPS Low Peak
200-amp. 600-v. Same switch	KTS Limitron LPS Low Peak
400-amp. 250-v.	LPN Low Peak
600-amp. 250-v.	LPN Low Peak

In recent tests at Bussmann Manufacturing Company's test station, Frank Adam Shutlbrak Switches, equipped with Bussmann high interrupting type fuses, went through a series of tests with switches "closed" on a 100,000-amp. short circuit. **NOT A SINGLE BREAKDOWN OCCURRED!**

Here's a powerful demonstration of the safety and dependability insured by Frank Adam's famous Shutlbrak mechanism. Ⓕ Safety Switches give positive protection to both men and equipment against every hazard that might be caused by the tremendous overloads and shorts that can occur in any distribution and feeder circuit.

It costs no more for the extra *vital margin of safety* provided by Frank Adam Switches. Specify this better equipment. A new brochure is just off the press—*write for yours!*

See our catalog in SWEET'S

FRANK ADAM ELECTRIC COMPANY
P. O. BOX 357, MAIN P. O. · ST. LOUIS 66, MO.

busway · panelboards · switchboards · service equipment · safety switches · load centers · Quiktrolar

For more facts circle 555 on Reply Card

MOVING huge tank with an American 300 Series Truck Crane.

Only American Gives You This Exclusive Line

ON CRAWLERS—ON RUBBER—ON RAIL

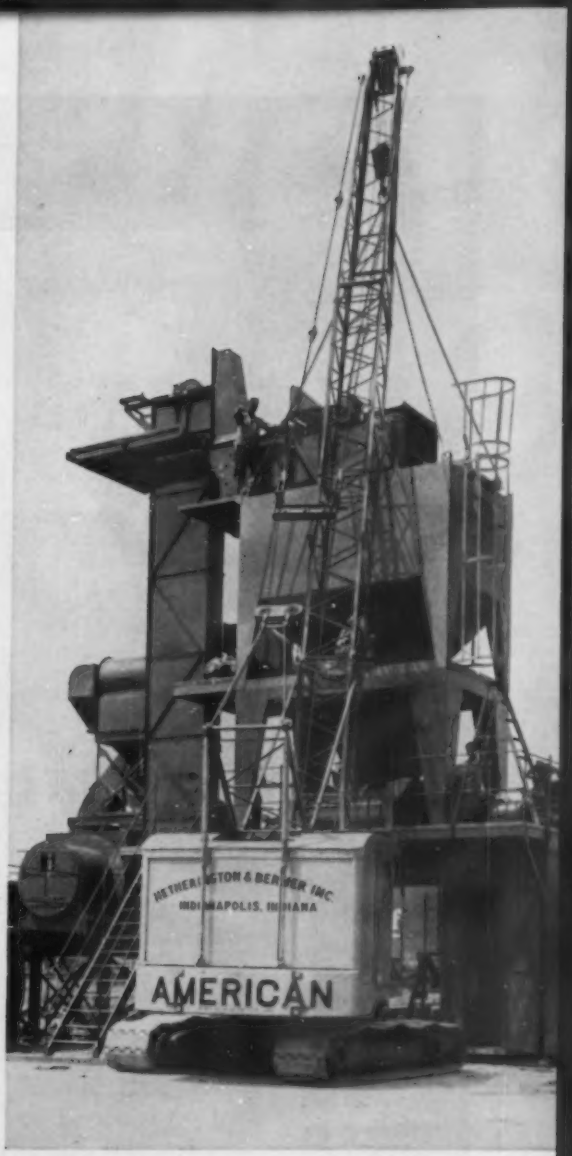
Whatever your demands, American Off-Track...On-Track Cranes assure you of top materials handling production

Here is American dependability at its best . . . boosting production on *any* materials handling job.

You can always count on the full line of American Crawlers, Truck and Self-propelled Cranes on the ground—Locomotive Cranes on Rail—to give you maximum effort in every type of work. Serving industry for over three-quarters of a century, American equipment is now better than ever . . . better than *any*. Write us for complete detailed and illustrated catalog information.

HANDLING long sections of pipe in the yard with an American 300 Series Truck Crane.

ASSEMBLY (right) of an asphalt mixing plant with a 300 Series American Crawler.



MANEUVERABILITY in crowded quarters (above) with an American Truck Crane.

HOOK WORK in the yard: American DiesELectric® Locomotive Crane.

AMERICAN HOIST
and Derrick Company
St. Paul 7, Minnesota

CROSBY-LAUGHLIN DIVISION
Drop forged fittings for wire rope-chain

EXCAVATORS-CRANES to 2 yds.-60 tons
LOCOMOTIVE CRANES to 130 tons

DERRICKS-HOISTS to 800 tons
REVOLVER CRANES to 400 tons

For more facts circle 556 on Reply Card

Who gets the best switchboard buy?

Don't buy switchboards blind. Most of your switchboard dollar goes into the circuit breakers. Be sure you know what make circuit breakers you are going to get before you buy your switchboard. And if it isn't I-T-E, kick like crazy. Because I-T-E gives you more value. Yet you pay no more. Want proof? Among independent switchboard builders everywhere, I-T-E is first choice.

Write today for the new bulletin on I-T-E molded case circuit breakers. I-T-E Circuit Breaker Company, Dept. SA, 1900 Hamilton St., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY

For more facts circle 557 on Reply Card

Just 24 minutes with this movie can save hundreds of man-hours in your plant

If you're concerned with cost control, don't miss Texaco's movie about grease, called "Shear Magic."

There's no hard sell in "Shear Magic." It's devoted entirely to helpful information on ways to cut the cost of maintenance and prevent unscheduled downtime.

A well-planned grease schedule can extend equipment life and cut repair costs and you can bring this message home to your maintenance men by having them see "Shear Magic." This movie suggests ideas for planning the grease schedule that best fits your operation. And it reminds the men that properly choosing and applying greases helps their company, because it assures tighter control of maintenance costs.

A Texaco Lubrication Engineer will be glad to arrange a showing of this full-color film in your plant. Or, if you wish, send for the informative Texaco booklet called *A Grease Schedule for Cost Control.* For quick action, mail the coupon today.

TEXACO

Texaco Inc.
Dept. E-G-30
135 East 42nd Street
New York 17, N. Y.

☐ Please send me more information about a free showing of "Shear Magic" to my organization.

☐ Please send me a copy of *A Grease Schedule for Cost Control.*

Name_____

Company_____

Address_____

City_____ State_____

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

For more facts circle 558 on Reply Card

TURBO-COMPRESSORS AND BLOWERS

2500 cfm and up

By Eugen P. Eicher, M.E., Brown Boveri Corp.

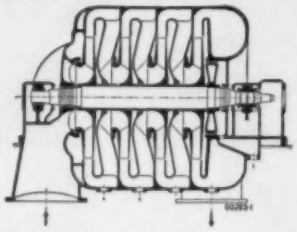
BROWN BOVERI

Brown Boveri offers complete compressor sets including compressor, choice of drives and all auxiliary equipment. Brown Boveri manufactures all the components, assembles and tests the complete sets in their own workshops and assumes full responsibility for the complete unit.

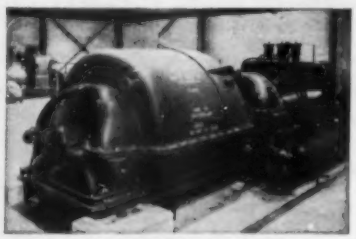
Compressors include a full range of centrifugal and axial types. Drives include steam turbines, gas turbines, expander turbines and electric motors. (Where hot waste gases are available, for example, a combination of motor-generator and exhaust-gas expander turbine drives has reduced power costs 60 to 70%.) Auxiliary equipment includes gear sets, pressure and volume regulators, air and gas coolers and complete electrical control systems.

Brown Boveri compressor sets are used by many leading U. S. companies and are backed by engineering skill, product reliability, and complete U. S. service staff and facilities.

2500 to 175,000 cfm at up to 60 psi* Uncooled centrifugal blowers



Four-stage centrifugal compressor.



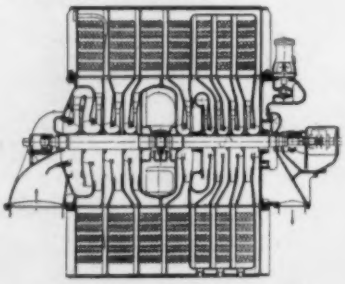
One of two 40,000 cfm centrifugal blowers with steam turbine drive in a copper conversion plant, Arizona.

First developed by Brown Boveri. Advantages over reciprocating compressors in the above ranges: lower cost, higher efficiency, less maintenance, less floor space and *clean, oil-free air.*

Standard designs are for air or non-poisonous, non-corrosive and non-explosive gases. Stainless steel impellers, shafts, etc. are available for corrosive gases. High-pressure casings and oil type sealing glands are available for higher pressures.

Applications: Blast furnaces, converters, coke ovens, gas distribution, process air and gases, air separation plants, sewage aeration, tunnel ventilation.

5000 to 80,000 cfm at 60 to 120 psi* Internally-cooled "Isotherm" centrifugal compressors



Nine-stage "Isotherm" compressor with anti-surge power-recovery turbine.

"Isotherm" compressor driven by a synchronous motor (left) and a waste-gas recovery turbine (right) at a California chemical plant.

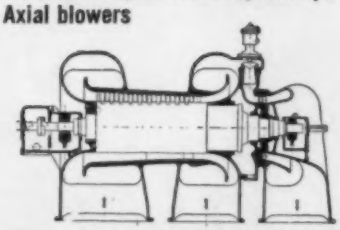
Highest inherent efficiency. Ten basic models with 6 to 9 stages per casing. Impeller diameters from approx. 1 ft. to 4 ft. The larger models include a built-in power-recovery turbine to allow running at loads below the surge limit.

Stainless steel impellers, shafts, etc. are available. For discharge pressures higher than 120 psi, "Isotherm" compressors are followed by an uncooled centrifugal compressor or other booster.

Drives: Four-pole synchronous motors are generally preferred for 1500 hp and larger units, other type motors for smaller sizes. Speed-increasing gears are used with all motor drives. Variable-speed steam or gas turbines are direct coupled.

The reliability of "Isotherm" compressors is proved by hundreds of installations in mines, shipyards, chemical process plants, air liquefying plants, aerodynamics laboratories.

10,000 to 500,000 cfm at up to 80 psi* Axial blowers



ten-stage axial compressor with anti-surge power recovery turbine.

Axial blower, steam turbine drive, supplying 70,000 cfm of air for a blast furnace.

Substantially more efficient than centrifugal units for large air volumes where adequate pressure can be delivered with a single unit and without cooling. The higher efficiency allows smaller and better drives and lower cost. A power-recovery turbine may be built in to permit operation at volumes below the surge limit.

Drives. Steam turbines allow simple, automatic control through Brown Boveri pressure-oil governors with pressure or volume regulator. Brown Boveri gas turbines and electric motor drives of all types are also available.

Applications: Gas turbines, wind tunnels and chemical plants. In Europe, Brown Boveri axial compressors driven by gas turbines are widely used for blast furnace air with substantial power savings.

**Capacities for single machines. Higher discharge pressures can be obtained by combining various types of equipment in series.*

BROWN BOVERI

U. S. Sales and Engineering: Brown Boveri Corp., Dept. PL-3, 19 Rector Street, New York 6, N. Y. Agents in 27 U. S. cities.

For more facts circle 559 on Reply Card

CONSTRUCTION BRIEFS —a review of fundamentals for the plant engineer

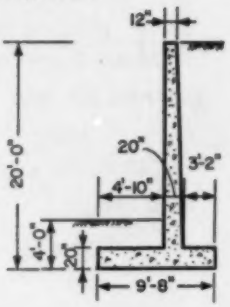
Prepared by B. A. Wasil, Structural Engineer

DESIGN OF RETAINING WALLS PART II

Design of a Cantilever Retaining Wall

Governing Data

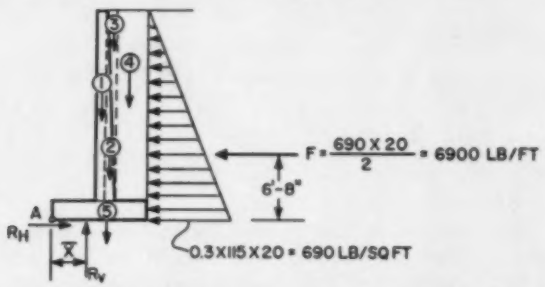
$p_{concrete}$ = 150 lb per cu ft
p_{soil} = 115 lb per cu ft
k_a = 0.30
f = 0.40
Bearing value f_b = 4 kips per sq ft



Allowable Stresses	*Design Constants*
f_s = 20,000 psi	k = 0.403
f'_c = 3000 psi	j = 0.866
f_c = 1350 psi	R = 236
v_c = 75 psi	n = 10
u = 240 psi	

Design

1. Location, direction and magnitude of resultant.



Vertical Loads	Moment Arm About 'A'	Stabilizing Moment
1. 18.33x1.0x150	= 2,750 x 5.33	= 14,680
2. 18.33x0.67x0.5x150	= 920 x 6.05	= 5,560
3. 18.33x0.67x0.5x115	= 700 x 6.27	= 4,390
4. 18.33x3.17x115	= 6,670 x 8.08	= 53,900
5. 9.67x1.67x150	= 2,420 x 4.83	= 11,700
	13,460 lb.	90,230 ft-lb

Overturning Moment = 6900x6.67 = 46,100 ft-lb

R_v = 13.460 lb
R_H = 6.900 lb

$$x = \frac{90{,}230 - 46{,}100}{13{,}460} = 3.28 \text{ ft}$$

$$\frac{9.67}{3} = 3.22 > x > \frac{2}{3} \times 9.67 \quad \text{OK}$$

2. Bearing Stresses

$$e = \frac{9.67}{2} - 3.28 = 1.55 \text{ ft}$$

$$\text{Toe } f_b = \frac{R_v}{W}\left(1 + \frac{6e}{W}\right)$$

$$\text{Heel } f_b = \frac{R_v}{W}\left(1 - \frac{6e}{W}\right)$$

$$\text{Toe } f_b = \frac{13{,}460}{9.67}\left(1 + \frac{6 \times 1.55}{9.67}\right) = 2730 \text{ lb per sq ft}$$

Since this is less than 4000 lb per sq ft, design is OK.

$$\text{Heel } f_b = \frac{13{,}460}{9.67}\left(1 - \frac{6 \times 1.55}{9.67}\right) = 51 \text{ lb per sq ft}$$

Since this is greater than zero, design is OK.

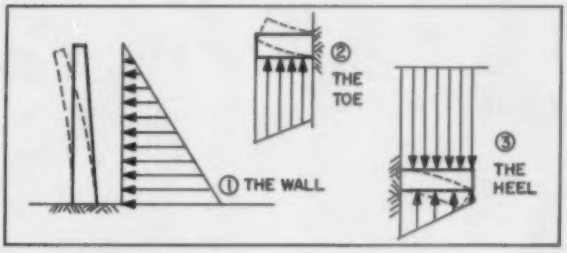
3. Resistance to sliding

$0.4 \times 13{,}460 = 5380 \text{ lb} < 6900 \text{ lb}$

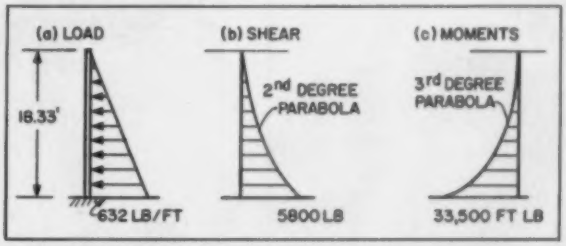
Therefore, provide a key on the base to provide a bearing resistance of 6900 - 5380 = 1520 lb. A 6-in. key will provide 4000 x 0.5 = 2000 lb. Therefore, use a 6-in. by 12-in. key.

Structural Design of Wall and Base

The wall is considered in three parts; each is designed as a cantilever beam.



4. Design of Wall



d. Design for compression

$$bd^2 = \frac{M}{R} \text{ (Design equation)}$$

$$12\,d^2 = \frac{35{,}500 \times 12}{236}; \quad d = 12.4 \text{ in.}$$

But d = 20 − 3½ (cover) = 16.5 in. OK

e. Check shear

$$v = \frac{V}{bjd} \text{ (Design equation)}$$

$$v = \frac{5800}{12 \times .866 \times 16.5} = 34 \text{ psi} < 75 \text{ psi; OK.}$$

f. Design for tension

$$A_s = \frac{M}{f_s jd} \text{ (Design equation)}$$

$$A_s = \frac{35{,}500 \times 12}{20{,}000 \times .866 \times 16.5} = 1.49 \text{ sq in.}$$

The amounts of steel used will be modified by some dowelling coming in from the base, thus it will be decided upon after the base has been designed.

g. Design for bond

$$\Sigma_o = \frac{V}{ujd} \text{ (Design equation)}$$

$$\Sigma_o = \frac{5800}{240 \times .866 \times 16.5} = 1.69 \text{ in.}$$

5. Design of Toe

For a, b and c, see sketch below.

d. Design for compression

$$12\,d^2 = \frac{24{,}000 \times 12}{236}; \; d = 10.1 \text{ in.} < 16.5 \text{ in.; OK.}$$

e. Check shear

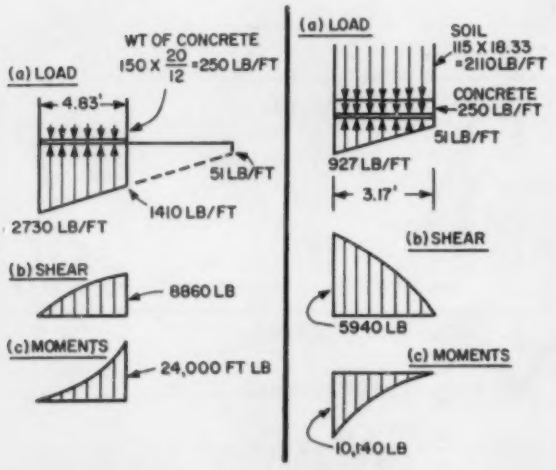
$$v = \frac{8860}{12 \times .866 \times 16.5} = 51.7 \text{ psi} < 75 \text{ psi; OK.}$$

f. Design for tension

$$A_s = \frac{24{,}000 \times 12}{20{,}000 \times .866 \times 16.5} = 1.01 \text{ sq in.}$$

g. Design for bond

$$\Sigma_o = \frac{8860}{240 \times .866 \times 16.5} = 2.58 \text{ in.}$$



DESIGN OF TOE DESIGN OF HEEL

6. Design of Heel

For a, b and c, see sketch.

d. Design for compression

$$12d^2 = \frac{10{,}140 \times 12}{236}; \; d = 6.56 < 16.5; \text{ OK.}$$

e. Check shear

$$v = \frac{5940}{12 \times .866 \times 16.5} = 34.7 \text{ psi} < 75 \text{ psi; OK.}$$

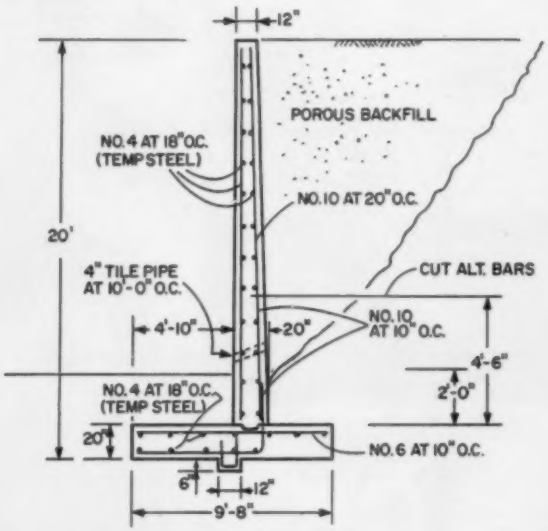
f. Design for tension

$$A_s = \frac{10{,}140 \times 12}{20{,}000 \times .866 \times 16.5} = 0.43 \text{ sq in.}$$

g. Design for bond

$$\Sigma_o = \frac{5940}{240 \times .866 \times 16.5} = 1.73 \text{ in.}$$

7. Final Sketch



8. Resume

The toe steel is bent up into the wall to be used as dowels. Thus the required wall steel at the base governs the selection of both wall steel and toe base steel.

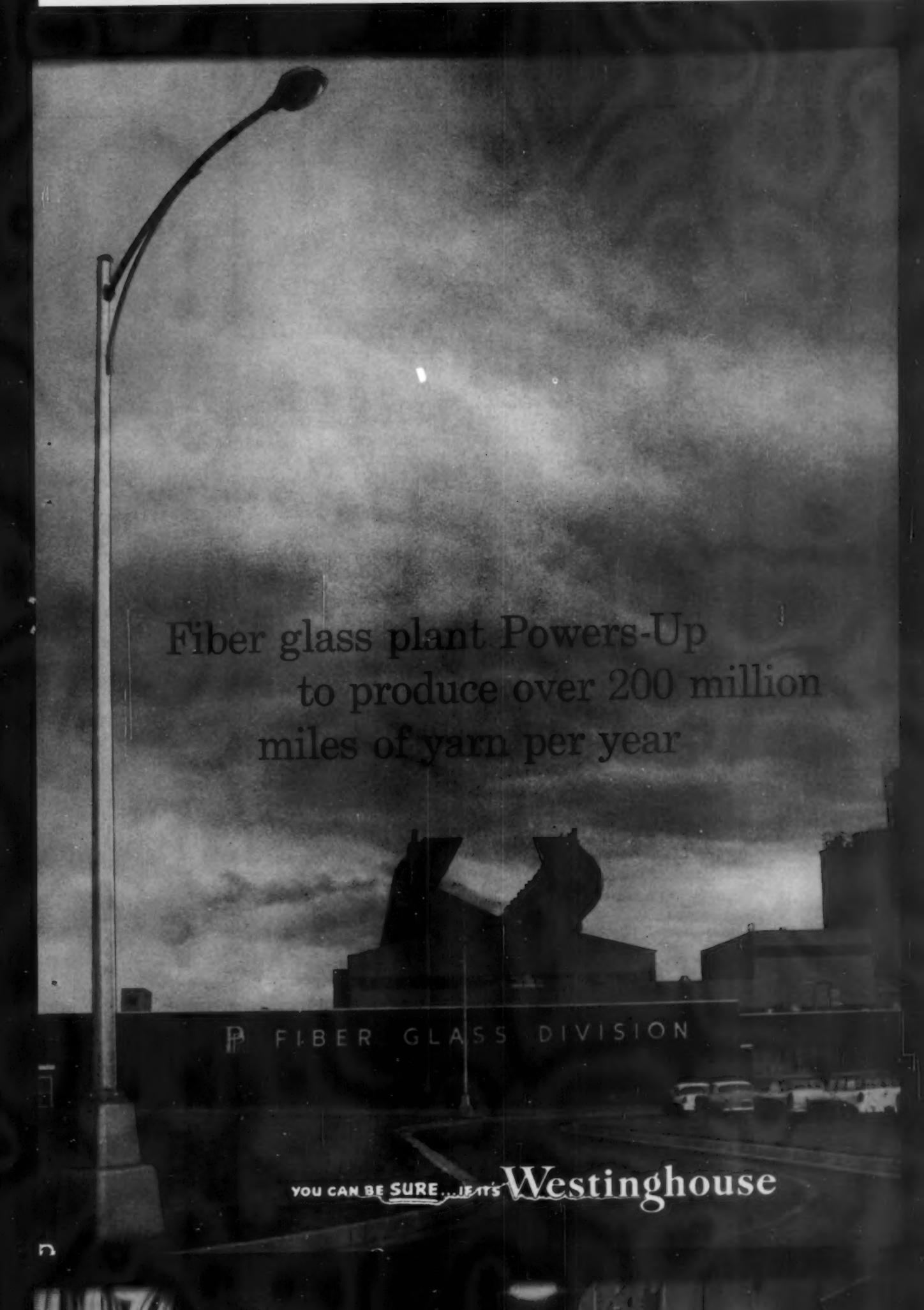
No. 10 bars, 10 in. o.c.: $A_s = 1.52$ sq in per ft
$\Sigma_o = 4.8$ in per ft

The heel steel meets its requirements as follows:

No. 6 bars, 10 in. o.c.: $A_s = 0.53$ sq in per ft
$\Sigma_o = 2.8$ in per ft

Since the moment diagram for the wall is a third degree parabola, the moment becomes one half of the base moment at a distance $(\frac{1}{2})^3$, or $\frac{1}{8}$ of the wall length from the bottom. This is 2.28 ft. Using 20 bar diameters for a lap, $20 \times \frac{10}{8} = 25$ in. This gives a total of cutoff for one half the vertical bars at 4 ft, 6 in.

Additional reinforcement (not required structurally) of No. 4 bars, 18 in. o.c., is used to protect surfaces against temperature changes.


Fiber glass plant Powers-Up
to produce over 200 million
miles of yarn per year
FIBER GLASS DIVISION
YOU CAN BE SURE...IF IT'S Westinghouse

Westinghouse coordinated system—engineered for today's production and tomorrow's expansion

A constant supply of electrical power, on a 24 hour a day basis, is a must in maintaining the continuous production of glass yarn. Pittsburgh Plate Glass Company, in planning for the new Fiber Glass Division plant in Shelby, North Carolina, made certain that an adequate, uninterrupted supply of power would be available for present production schedules and future expanded schedules.

A sectionalized electrical loop system was specified to provide for duplicate feed from the 15 kv main substation to each power center. This insures the constant service needed for the continuous glass process line.

Specification of Westinghouse equipment provided the important advantages of (1) a single order source, (2) the facility with which components combine in installation, (3) provisions for future expansion made in the equipment being installed and (4) the ease with which additional Westinghouse equipment can be added when required. A 50% expansion program is already in progress, because of the increased public acceptance of this high quality fiber glass yarn. *(cont'd.)*

YOU CAN BE SURE...IF IT'S

Westinghouse

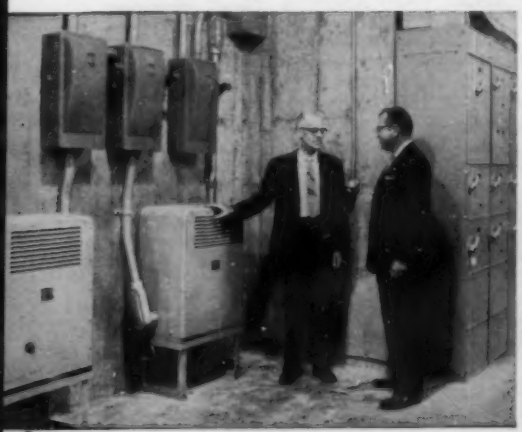
COVER PHOTO: Exterior view of Fiber Glass Division plant of the Pittsburgh Plate Glass Company, Shelby, North Carolina. Shown in foreground is one of 33 Westinghouse OV-20 mercury luminaires located in the driveway and parking areas.

Examining plant plans are: C. Y. House, Westinghouse Construction Specialist; J. A. Gillespie, Representative, Lockwood Greene Engineers, Inc., Architect-Engineers, Spartanburg, S. C.; J. R. Miller, Westinghouse Construction Sales Engineer; R. T. Ariail, Branch Manager, WESCO—Greenville, S. C.; G. H. Hollis, Ass't. Plant Engineer, Fiber Glass Division, Pittsburgh Plate Glass Co.; W. P. Dearman, Davis Mechanical Contractors, Inc., Electrical Contractor; W. A. Brunnick, Plant Engineer, Fiber Glass Division, Pittsburgh Plate Glass Co., Shelby, N. C.

Westinghouse 600 amp plug-in bus duct in spinning room. Fusible plug-in units supply a power take-off point wherever required for the spinning machines and also provide protection and control for the circuits. J-94135-2

W. A. Brunnick, J. A. Gillespie and W. P. Dearman in front of Westinghouse 3000 kva double ended dry-type ASL power center (each transformer rated 1500 kva). The section of Westinghouse low voltage switchgear shown at left contains draw-out type DB-25 air circuit breakers which have been added after the initial installation. Air blast equipment installed on transformers increased capacity to allow for this expansion. Westinghouse Class 11-350 motor control center of new design is shown at right.

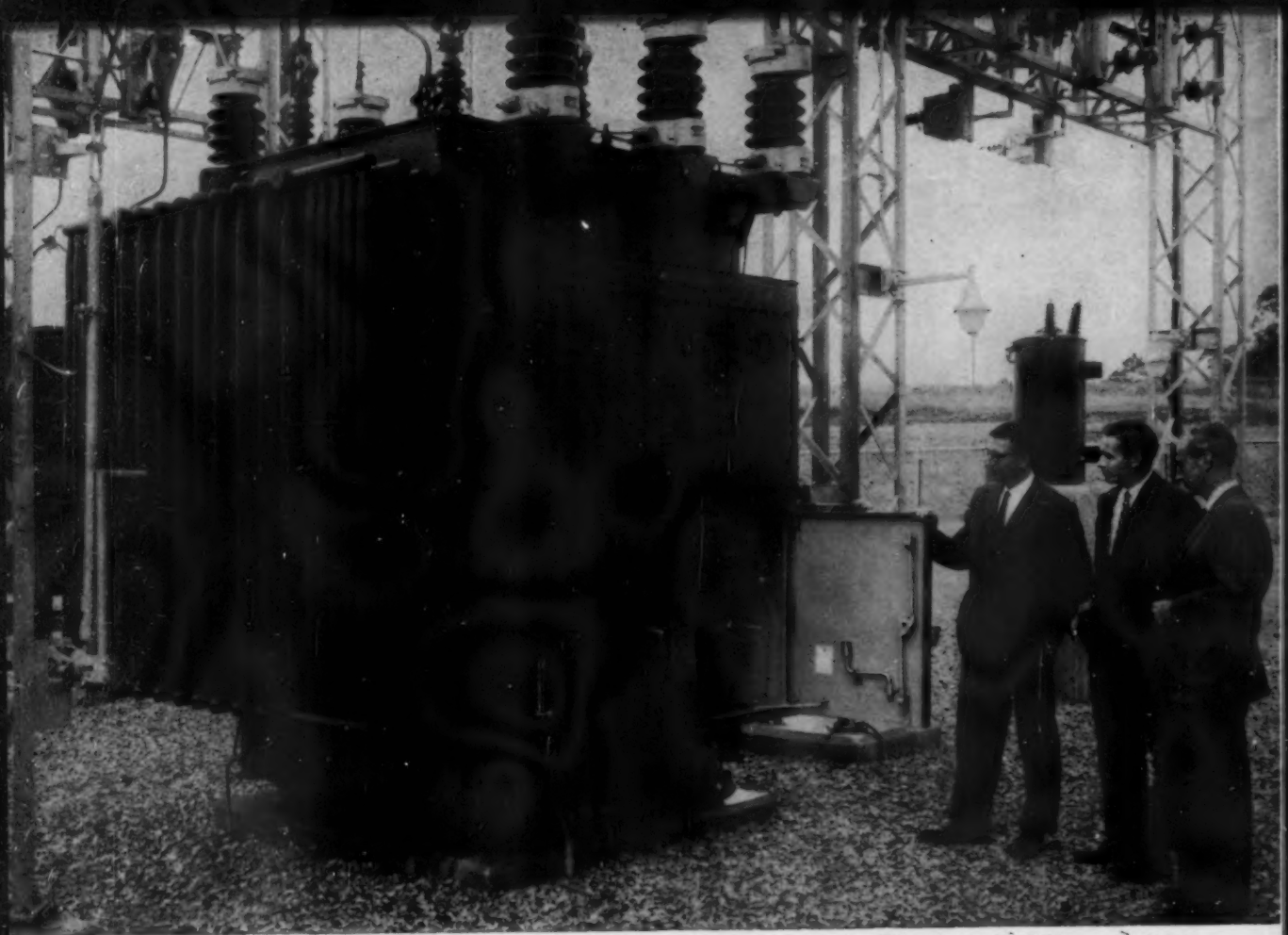
J-94135-3



G. H. Hollis and J. W. Rigdon, Westinghouse Industrial Sales Engineer, are shown with two of the many Westinghouse 45 kva DT-3 dry-type transformers used to step down system voltage to 208y/120. Wall mounted safety switches shown above transformers are all of the fusible type rated 200 amp. At right is Class 11-350 motor control center which combines all equipment room motor control into one centralized structure. Modular design assures interchangeability of starter units.

Westinghouse NLAB column type panelboard with wiring trough and pull box is examined by J. A. Gillespie and C. Y. House. The quick-lag breakers in this panelboard offer protection against overloads and short circuits for the lighting and receptacle circuits.

Westinghouse type 50 hp Life-Line® CSP induction motor driving the chilled water pump in the refrigeration system.



J. A. Gillespie, J. R. Miller and W. P. Dearman inspecting Magamp control panel of Westinghouse 1000 kva URS step type voltage regulator in the main substation. Westinghouse station type feeder voltage regulators will maintain the correct voltage automatically regardless of load conditions. Full power is always available to all motors and machines insuring operation at their highest efficiency.

Westinghouse system for today's production and tomorrow's expansion *(cont'd.)*

Powering-Up electrically for present needs and providing for anticipated future expansion can mean important benefits and savings in any industrial plant construction. For information about what such benefits and savings can mean to you, call the Westinghouse distribution outlet nearest you, or write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania.

J-94135-4

OWNER: Pittsburgh Plate Glass Co., Pittsburgh, Pa.

ARCHITECT-ENGINEER: Lockwood Greene Engineers, Inc., New York, N.Y.

GENERAL CONTRACTOR: Daniel Construction Co., Greenville, S.C.

ELECTRICAL CONTRACTOR: Davis Mechanical Contractors, Inc., Greenville, S.C.

ELECTRICAL DISTRIBUTOR: Westinghouse Electric Supply Co., Greenville, S.C.

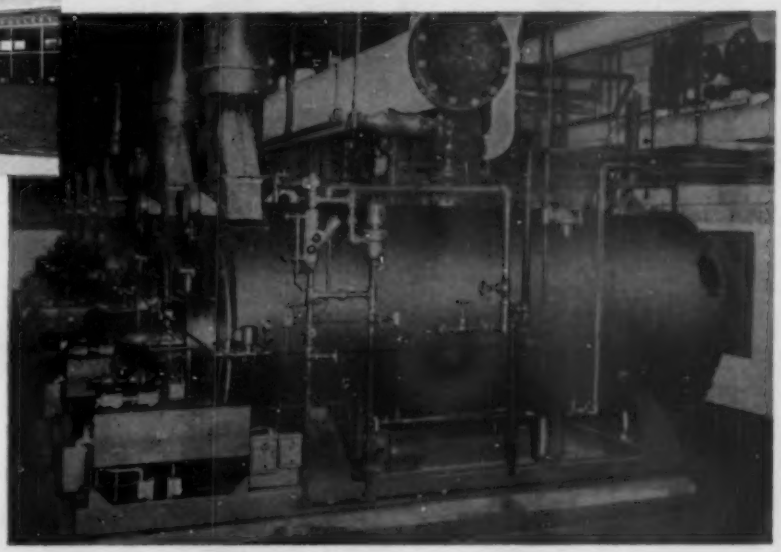
YOU CAN BE SURE... IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS," CBS TV, ALTERNATE FRIDAYS

For more facts circle 560 on Reply Card

Close-up view of finished glass yarn ready for packing and shipment. Each of these spools averages 45,000 yards of yarn for use by the textile industries.

Never more steam than you can use . . .
never less steam than you should have!



One of the largest producers of graders, roadscrapers and rolling equipment, Galion Iron Works & Manufacturing Co., has six 125 HP Cyclotherms now operating, plans to add a seventh and eighth as steam demands increase. Automatic operation has been the big factor in helping Cyclotherm make the grade with the graders!

Like GALION ESTABLISHED 1907 Iron Works, plan for tomorrow with

CYCLOTHERM!

With Cyclotherm Steam and Hot Water Generators, you buy steam capacity as you use it. No investment in excess capacity. No steam shortage with an outgrown boiler.

Cyclotherms give flexible capacity. You can add 518 lbs. of steam per hr. with a 15 HP Cyclotherm, or 25,875 lbs. per hr. with a 750 HP Cyclotherm. And there are 16 intermediate sizes to choose from.

AUTOMATIC OPERATION

Cyclotherms operate with automatic efficiency. On 15 to 60 HP units, burner automatically shuts down when steam demands are satisfied, automatically turns on when more steam is needed. On 80 to 750 HP units, modulation controls regulate firing rate from 30% to 100% of rated capacity, without loss of efficiency. Operation stops automatically if firing sequence is interrupted and unit "fails safe."

BUILT TOGETHER TO WORK TOGETHER

Cyclotherm burner and boiler are built together to work together — one manufacturing responsibility back of the entire equipment. Units are fire-tested at factory, shipped ready to operate. Cyclotherms are up to 1/3 smaller than other package boilers of same capacity. Installation is easy—no costly stack, no excavation, no foundation.

"CYCLONIC COMBUSTION"

"Cyclonic Combustion"—Cyclotherm's patented combustion principle—guarantees a minimum of 80% efficiency, meets all state requirements, conforms to A.S.M.E. and National Board standards, carries Underwriters' Laboratories label. Steam Generators from 15 HP to 750 HP, burn oil and/or gas. Hot Water generators in 10 capacities, from 670, 000 BTU per hr. to 6,700,000 BTU per hr.

YEARS AHEAD IN STEAM & HOT WATER GENERATION
CYCLOTHERM®
STEAM AND HOT WATER GENERATORS

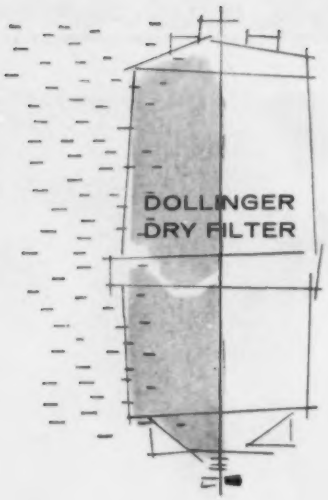
Cyclotherm Division of Crane Co. • 54 E. First St., Oswego, N. Y.

Clip to Your Letterhead

54

Please send me your booklet Cyclotherm Cyclonic Combustion, also rotogravure copy of Cyclotherm Sales Steam with illustrations and descriptions of Cyclotherm installations.

For more facts circle 561 on Reply Card



SPECIALISTS
FOR 39 YEARS

TRAP DIRT, SCALE,

Typical application of Staynew Filters is in the manufacture of nylon. Located at key spots on the process lines, efficient Staynew filtering removes contaminants from ammonia, caustic soda, phosphoric acid and other chemicals. One of the world's largest producers of nylon, whose plant is shown at right, specifies Staynew Filters to help maintain the high standards of fine nylon yarn. Write for Staynew Liquid Filter Bulletin 300.

PREVENT EQUIPMENT DAMAGE

DOLLINGER STAYNEW LIQUID FILTERS can be used for cleaning oil on machine tools, for protecting hydraulic controls and diesel engine fuel oil injection systems, and for the filtering of most coolants. They can be easily adapted to solve any problem where rust, dirt, pipe scale and other contaminants need be removed from process liquids. They are ideal for filtering water and all types of liquid chemicals. Staynew Liquid Filters, manufactured in accordance with ASME code, are designed to handle practically *all* fluids efficiently and economically.

There are many advantages to using Staynew Liquid Filters. For instance, the exclusive radial fin construction provides the greatest active filtering area for available space . . . allows more contaminant collection on the outside, yet ample inside space for flow of clean liquid. "Slip-on" construction of the filter permits the filtering medium to be cleaned or replaced in minutes. Simple removal of a wing nut makes handling and maintenance easy. Sizes and models available to fit all applications.

If you have a liquid filtration problem—or any other types of filtration difficulties—consult your local Dollinger representative. He will be glad to discuss Dollinger's complete line of industrial filters with you. Or, write for bulletins indicated. Dollinger Corporation, 55 Centre Park, Rochester 3, N. Y.

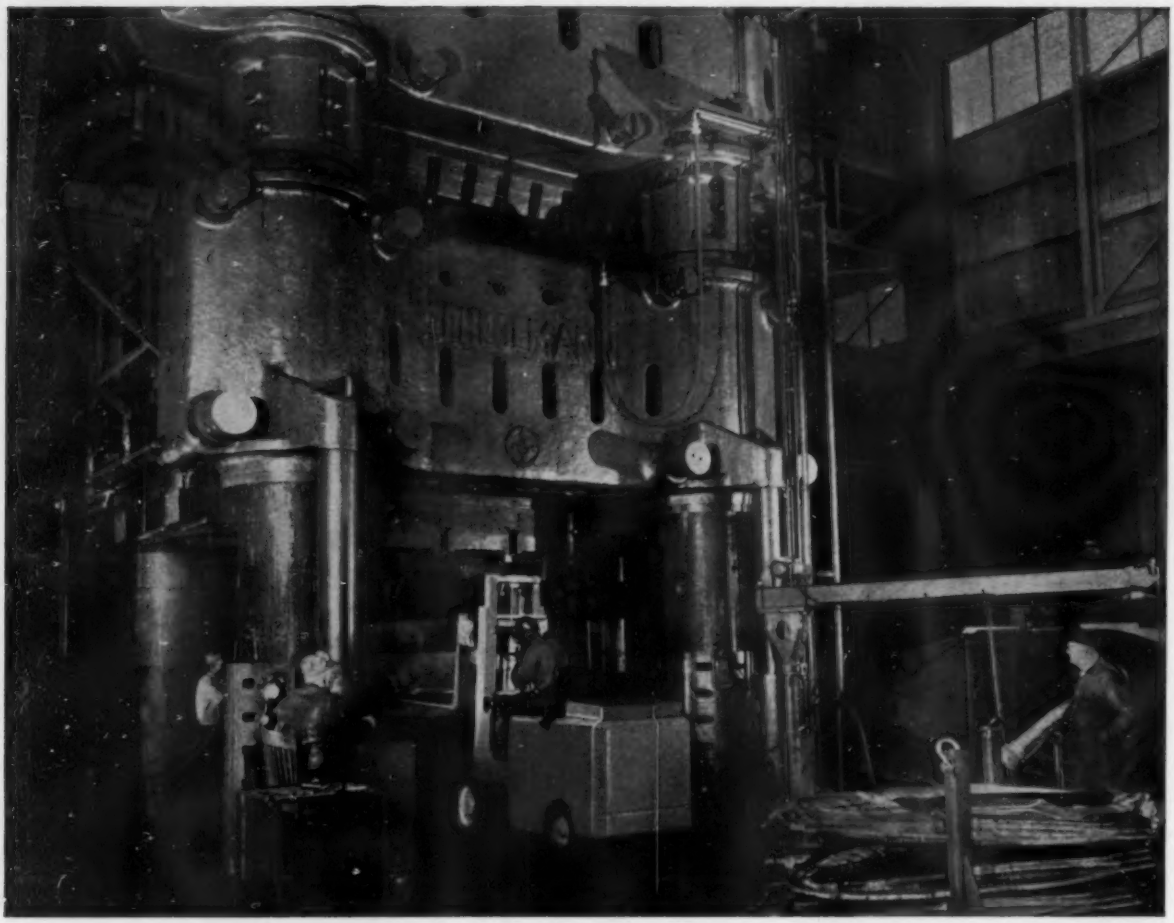
PROTECTOMOTOR

STAYNEW FILTERS

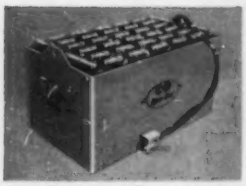
DOLLINGER

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS • HIGH PRESSURE FILTERS AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

For more facts circle 562 on Reply Card



Get full production from electric trucks— Power with C&D *Slyver-Clad*® batteries!



Records from many types of operations prove electric trucks are best for materials handling operations requiring industrial trucks. And when you power them with premium C & D *Slyver-Clad*® batteries, you get maximum capacity per unit of space. This in turn means continuous, full-production, without power letdown at the end of a shift.

In addition, C & D premium *Slyver-Clad* batteries have *Hi-Impac* cell covers and containers. This *exclusive* C & D feature alone virtually eliminates taking a truck out of service because of physical damage to the battery.

C & D batteries have Five-Fold *Slyver-Clad* insulation and retention that assures maximum life with full capacity to the end of that life, plus *AccuPak*® plates that are automatically pasted and 100% inspected by AccuRay**. They are the longest, thickest plates available in any industrial battery. You get built-in extra life and the AccuRay inspection eliminates any possibility of trouble because of low cells.

C & D premium *Slyver-Clad* batteries are available with capacities from 225 to 2175 A.H. at the six hour rate and in any standard tray arrangement. Write for Bulletin IT-528 and see why —*C & D is your better battery buy.*

C&D C & D BATTERIES
of Conshohocken, Pa.... Attica, Ind.
DIV. THE ELECTRIC AUTOLITE CO.

Manufacturers of Slyver-Clad® Industrial Batteries • PlastiCell* and PlastiCal® Batteries for Communications, Control, and Auxiliary Power • Producers of AutoReg® Silicon Chargers and AutoCal* Charger-Battery Combinations

*® *Trademark, C & D Batteries Div. The Electric Autolite Co.*
** *Trademark, Industrial Nucleonics Corp., Columbus, Ohio*

For more facts circle 563 on Reply Card

WHAT'S JUST AHEAD IN THIS ISSUE?

- THERE ARE MANY applications where heat-shielding is a must, but where visibility is equally important. The answer in such cases could be heat-shielding glass. Infrared rays bounce off the transparent metallic oxide film bonded to one side of this glass, keeping people or equipment on the other side reasonably cool and comfortable. To learn more about radiant shielding, turn to page 106.

- PLANT PAGING SYSTEMS require periodic maintenance to insure intelligible voice amplification. There are several specific areas where malfunction can occur—microphone, amplifier or loudspeaker. So, if your public address system sounds "muddy", turn to page 111 for tips on how to keep it in first class condition.

- LUBRICATION "by the numbers" is just what Westinghouse is doing at its Athens, Georgia, plant. Plastic tags, containing such information as lubricant point number, code number and frequency of lubrication are placed on all equipment. This system has simplified their lubrication program. Turn to page 114 to get the complete story.

- LOCATING LEAKS in a plant piping system can present quite a few headaches. However, the General Motors Research Labs have found an easy solution. The plant engineering people got together with the radioisotope section to devise a sealed radioactive carrier which has simplified the job of detecting leaks. To get the full story, see page 117.

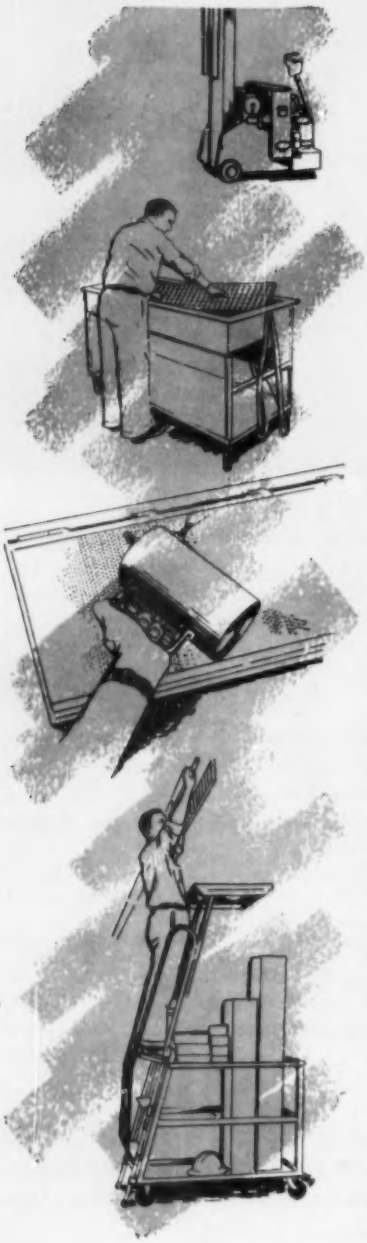
- ARE BURNED and cracked welds a problem in your shop? If your plant operators are causing welding rejects because they raise welder output beyond prescribed settings, then a form of current control may be desirable. For a simple method of installing welding current control, read "Shunt Limits Current—Prevents Burned Welds," beginning on page 120.

- AIR COMPRESSOR UNLOADING can eat up quite a bit of time if it is done manually. Repeated repair and adjustment of pilot valves can add to your woes. However, unloading time and maintenance can be reduced considerably by the installation of electrical controls. For the complete description of such a hookup and how it can work for you, turn to page 131.

- EFFECTIVE MAINTENANCE of plant lighting systems is dependent upon adequate methods and procedures. For answers to these questions: "Who does the work?" "Group relamp or spot relamp?" "Work records needed?" and "How often do we wash fixtures?" turn to the next page.

METHODS and PROCEDURES FOR LIGHTING SYSTEM MAINTENANCE

By A. E. ROBERTS, Maintenance Engineer, General Motors Technical Center, Warren, Michigan



"PROVIDING an atmosphere of unconscious comfort" is, I have heard, the goal of a good air conditioning system. It seems to me that this is also the goal of a really good lighting system. Both the initial design of the system and its maintenance should enable the occupants of an area to perform their assigned tasks without being conscious of the lighting system.

In our case, we are relatively fortunate as our facilities are quite new and the lighting systems in almost all areas meet the requirements of unconscious comfort. It was soon realized that to continue this desirable condition, a maintenance program must be established that would keep the illumination up to design levels.

To give you an idea of the scope of this problem, we have over 22,000 lamps in eight buildings covering an area of approximately 800,000 sq ft. We have luminous ceilings, 40 watt and 90 watt RLM fluorescent fixtures, two and three lamp fluorescent fixtures with egg-crate or plastic diffusers, high-bay mercury vapor and incandescent fixtures, vapor-proof and explosion-proof fixtures and an assortment of specialty fixtures such as stage lighting units, high-hat downlights and recessed cove lighting fixtures.

One of the first steps in the solution of this problem of lighting maintenance was to decide who would do the work. Since the great majority of labor would consist of washing and relamping fixtures, it was decided to create a job classification of lamp changer with a pay rate slightly higher than that of a janitor. Two former janitors were trained in the methods of washing fixtures and to properly identify the types of lamps used.

It was also necessary to instruct them in the method of changing lamps in explosion-proof fixtures. The job of repairing any electrical trouble such as a faulty ballast or damaged socket was retained by the electricians.

Our method of handling lighting maintenance is to divide the system into smaller areas. These areas have similar fixtures, about the same mounting height and lamps with approximately the same burning hours. This breaks the lighting maintenance problem into many smaller problems containing less variables and makes it easier to determine the best and most economical type of maintenance for each area.

Information describing each area and a record of the work done is kept in a Kardex file. Permanent file cards, Fig. 1, remain in the office. The work card, Fig. 2, is given to the lamp changers when there is work to be done in an area. The card gives the location of the area, type and numbers of fixtures and lamps, and a description of the work to be done. Columns at the bottom of the card are used by the lamp changer to record the work performed. This is then recorded on the permanent file card.

Who Does The Work?

Group Relamp or Spot Relamp?

What Work Records Do We Need?

How Often Do We Wash Fixtures?

Can We Afford Special Equipment?

How About Lamp And Fixture Improvements?

Work cards are scheduled so that lamp changers receive each card at least once a month for spot replacement of lamps in the area listed on the card. Lamp changers are also given work cards for areas that are to be washed or group relamped.

Furnishing these cards at the start of the shift has proven to be a valuable aid in reducing needless trips to the storeroom. With the information contained on the cards, the lamp changer can plan his work and stock up on the types of lamps and starters he will need.

Lamp changers record the amount of time spent in each area on their time card, Fig. 3. This time is then transferred to the permanent Kardex file.

Based on the information accumulated on these cards, we have found it most economical to practice group relamping in some areas. At present, we change all the lamps in the area when 20 per cent of the lamps have burned out. The record of spot replacement tells us when it is time to schedule the group relamping which is usually done at the same time as the next scheduled washing of fixtures in the area.

Fixture washing is scheduled in most areas once each year but tests are conducted prior to issuing the order to make sure the washing is required. If the lumen depreciation is so small that washing is not needed, the job is rescheduled for a later date.

One exception to this yearly washing schedule is the foundry area where fixtures are washed twice a year. Lumen depreciation is quite rapid in this area due to the dusty atmosphere and more frequent washing is required to maintain satisfactory lighting levels. Another exception are some areas using incandescent lamps. Lamps are spot replaced and washing is done when the lamp changer feels it is necessary.

Type of lamp replacement used in each area depends upon the economics of maintaining the area

Fig. 1. Information on each area and a record of work done is kept in the office master file.

Fig. 2. Work cards are given to the lamp changer, show work to be done in an area.

LIGHTING MAINTENANCE — Card No. P-19, Sched. MONTHLY

Building: MANUFACTURING
Area or room: PROCESS DRAFTING ROOM
Type Fixture: 2-40 W GLASS DIFF. Number: 78

Number of Lamps: 156
Type Lamp: F40T12/CW

Instructions

Group Relamping: and Inspect Monthly
Spot Replacement:
Group Replace after: 31 Burnouts
Group Cleaning: ANNUAL
Spot Cleaning:

Lamps Changed	Date	Fixtures Cleaned	Date	Total Burnouts To Date	Date

DAILY LIGHTING MAINTENANCE CARD

Name _____ Clock No. _____ Date _____

Area	Lamps Replaced	Fixtures Washed	Starters Replaced	Start	Finish

Fig. 3. Lamp changers record amounts of time spent in each area on this time card. This information is transferred to the master office file.

Fig. 4. Raising or lowering platform on this lift can be controlled either from the ground or the platform.

Fig. 5. Used for fixtures mounted below 12 ft, this cart is easy to move and carries a supply of lamps.

weighed against the requirements. In some areas, group relamping has proven very practical and economical. We calculate the labor and lamp replacement cost from the information on the file cards and this coupled with any peculiarities of the area determines if group relamping or spot relamping will be used.

As an example, we have areas such as our lobby and cafeteria where appearance is very important. A lamp outage in these areas cannot be tolerated for any great length of time and lamps are checked on a weekly schedule. Areas using fluorescent lamps are group relamped after we have replaced 20 per cent of the lamps in the area by our scheduled monthly replacement program.

Since the start of this maintenance program our lighting system has steadily grown. However, we have continued to maintain the system with our two original lamp changers. We have been able to do this by changing some of the areas from spot relamping to group relamping.

In our high-bay areas we are now using the 2000-hour reflector incandescent lamps instead of the 750-

hour lamps previously used. The slightly lower efficiency of this long-life lamp is compensated for by a substantial reduction in maintenance labor required to service this area.

Special equipment has been purchased to enable the lamp changers to work more efficiently. An electric fork truck, Fig. 4, has been adapted for this work and each lamp changer has one of these units to help speed up the work. As the lamp changers work on the night shift, these trucks are also used by the janitors and maintenance men on the day shift. Raising and lowering the platform can be controlled either from the ground or the platform. This unit is used when working with fixtures with a mounting height up to 20 ft.

A different type of unit, Fig. 5, is used when working with fixtures mounted below 12 ft. This cart enables the lamp changer to carry a large supply of lamps with him in addition to having a ladder readily available. The platform on the top of the cart raises to give the men support when working from the top step of the ladder.

A pressure container, Fig. 6, is used for washing fixtures. It is filled with a mixture of water and non-ionic detergent, then pressurized with 90 lb of air from the plant air supply. Depressing the lever on the container sprays a misty film of the solution on the fixture.

This method eliminates the usual buckets and drop cloths required with conventional washing procedures. Any of the solution that misses the fixture is so finely dispersed that it cannot be noticed on any of the work surfaces in the room. The container is carried right on the cart so that incandescent fixtures can be washed as the lamps are changed. One filling of the container usually lasts about four hours.

Washing louvers has been simplified by the use of the cart shown in Fig. 7. Two tanks are used, one for the cleaning solution and one for rinsing. Louvers are drip-dried on the racks on the back of the cart.

A red tag, Fig. 8, is used to coordinate the work between the lamp changers and the electricians. The tags are large, six inches by four inches, and the bright color makes them easy to see in a large area. Each tag and a slip attached to it are numbered.

When a lamp changer finds a fixture requiring electrical repairs, he hangs the tag on the fixture and fills out the slip attached to the tag. This slip gives the nature of the fault and the location of the fixture. A maintenance order for the electrician is originated from these slips and after the repair is completed, the red tag is returned to the office. Since the tag is easily seen from the floor and the number on the tag avoids any confusion as to which fixture is to be repaired, this method has helped keep our lighting system in good repair.

Experience gained in maintaining our lighting system over the past five years has made us realize that lighting maintenance must be given as much thought as the original design of the system. The maintenance program can never be static but must keep up with new developments in lamps, fixtures and maintenance equipment. The program must be flexible enough to take advantage of those changes. These developments, together with experience and records of present practices, will continually point out more efficient methods of maintaining the lighting system. **End**

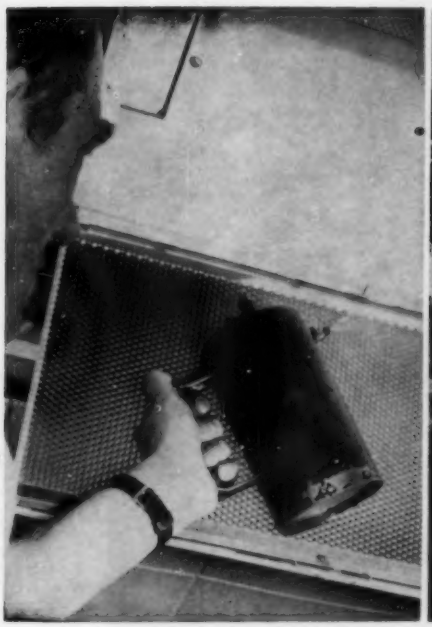
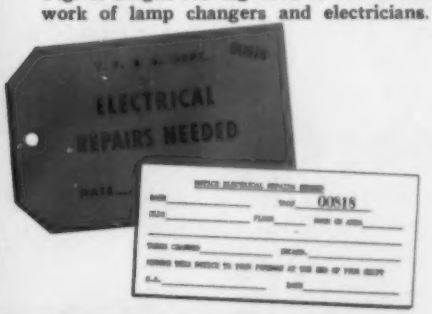


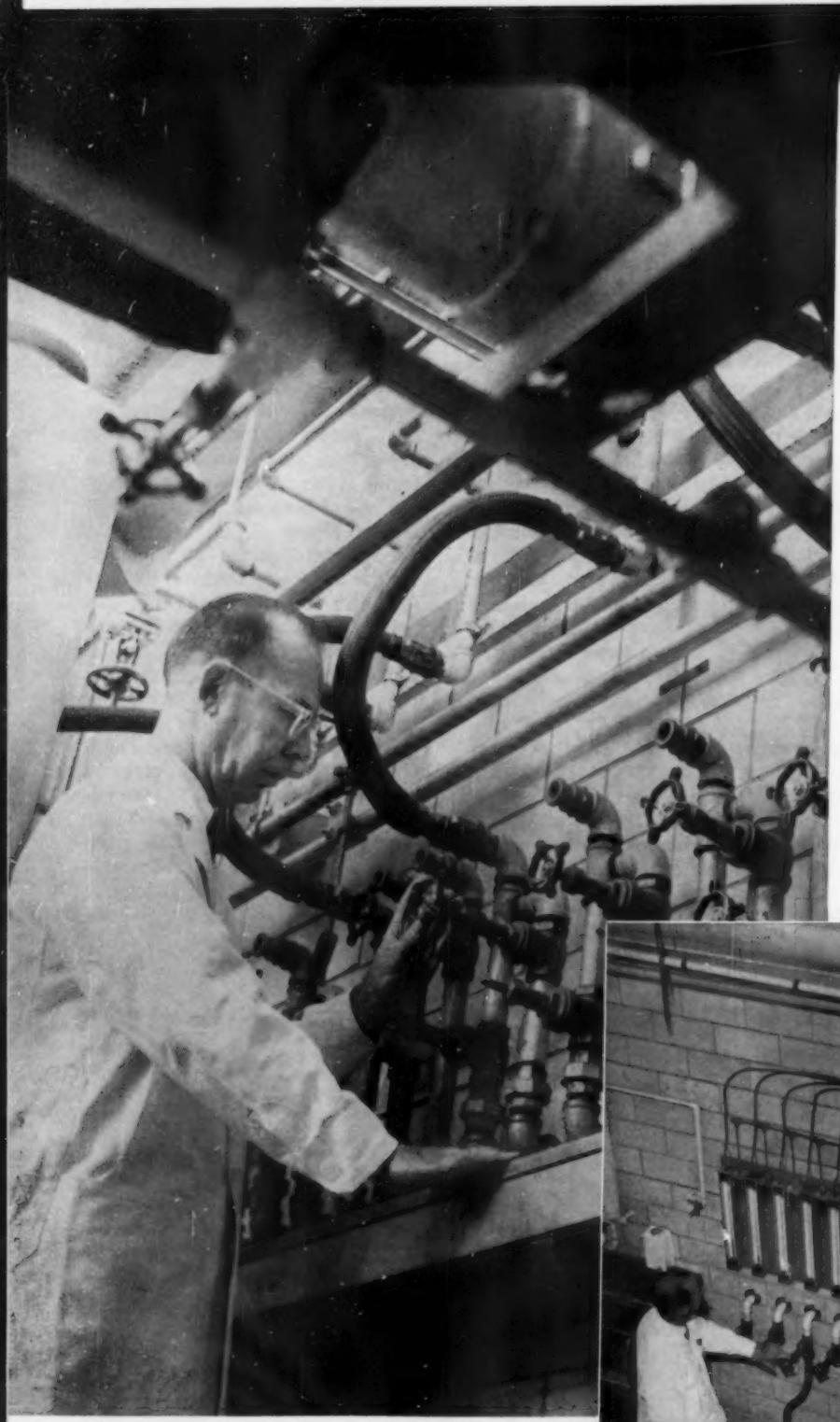
Fig. 6. Pressure container, filled with water and detergent, washes fixtures without using drop cloths.

Fig. 7. Washing louvers has been simplified by use of special cart equipped with two separate tanks.

Fig. 8. Bright red tag used to coordinate work of lamp changers and electricians.

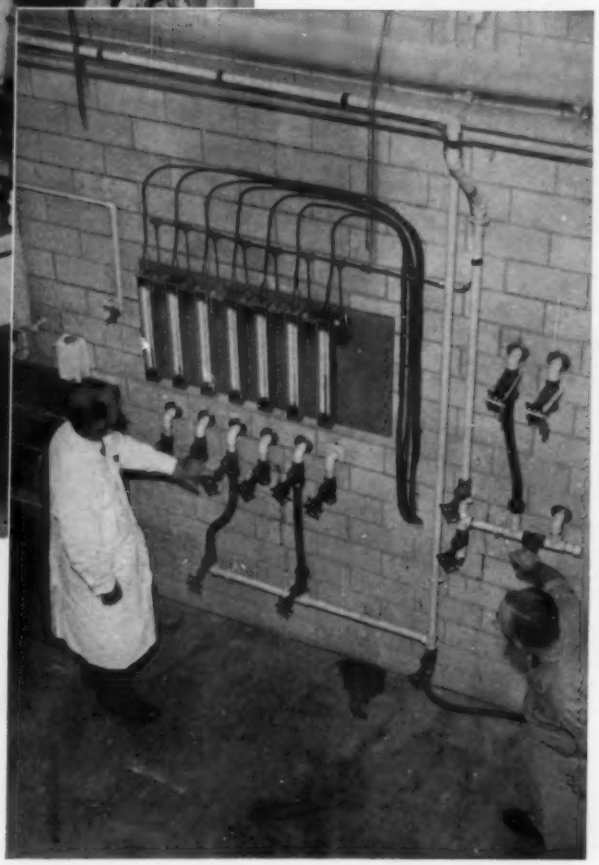


A PIPING



At Ciba, nine different inlets from the various solvent tanks can be connected to the main process equipment by lengths of flexible hose. Tank farm inlets are in the center and the process piping is above. Control is said to be absolute . . . no valves can be left open, inadvertently, to contaminate the system during any operation. The arrangement can be checked, with a glance, from across the room. Connections are made by hand and are broken by hand.

Below: A graphic flow control shows temperatures of solvents and tells which solvents are entering the system. Inlets from tank farm are ranged under individual thermometers. Process line is at bottom of the photo near wall.



Flexible hose has been used successfully at Ciba Pharmaceutical to expedite liquid transfer operations

COMPLEX IS SIMPLIFIED WITH HOSE

PLANT ENGINEERS are fast learning that a length of flexible hose can save a thousand worries—if the hose is used correctly and within its design range. Engineers at Ciba Pharmaceutical Products, Inc., Summit, N. J., for instance, have incorporated high-performance flexible hoses wherever they can, to add dependability or simplicity to an operation.

This plant is engaged primarily in the production of pharmaceutical bulk materials for tablets, ointments and creams. Much of the bulk chemical storage consists of a tank farm outside the buildings. Solvents include denatured ethyl alcohol, methanol, isopropyl alcohol, toluol, acetone, and petroleum naptha.

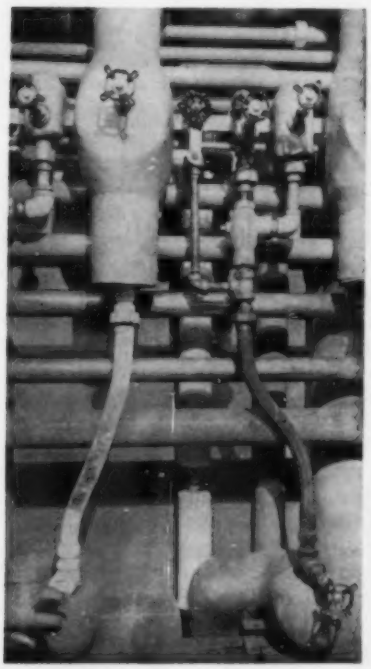
Pipes from the tanks to inlets within the building are attached to the process piping by "jumper" lengths of flexible hose. In a bank of six inlets, for example, only two are used at the same time. Jumpers connect them to the main line.

Engineers working with the process find the flexible hoses are reliable and can be switched quickly. What's more, any particular hookup can be identified at a glance from some distance away. This simple arrangement makes it unlikely there will be leakage or mistakes in valve openings. Hoses used in the installation are of the all-metal variety manufactured by Titeflex, Inc. The inner core is brazed and convoluted brass, reinforced with silicon bronze wire braid. Fittings, also are brass.

The various solvents are supplied from the tank farm to the main process lines at different temperatures. Heating is accomplished with steam at 40 psi and 135 C. Cooling is accomplished with brine at —10 C. Again, the same flexible hose is used to supply both steam and sub-zero brine. This eliminates the need for complicated piping.

Some of the reagents that are regularly handled at Summit include chemically reactive solutions. At one mixing tank any of three liquids may be added to the tank through a single length of flexible hose. One of the liquids is a reactive organic compound in alcohol; it is slightly alkaline. This property ruled out the use of brass hose so, for this application, Ciba specified a seamless stainless steel hose. The inner core of this hose is a seamless tube formed into a bellows-like configuration and covered with stainless braid.

Ciba maintains a large solvent-recovery building for storing and reprocessing spent solvent. The tank farm connected to this building includes tanks ranging from 5000 to 10,000 gal capacity. Each tank has a metering station and a by-pass line used to withdraw small samples of the solvents into appropriate containers. Each outlet utilizes a length of flexible hose so that containers of various sizes can be accommodated. **End**



Cold and hot—side by side. Hose at left carries brine at minus 10 C and hose at right carries steam at 135 C —with equal facility. Steam or brine sources can quickly be connected to other vessels by convenient fittings.

The metering system in the solvent recovery plant at the Ciba facility allows small portions to be drawn from the big tanks. Hose is necessary to accommodate the variety of vessels that receive the different solvents. Whether the container is handheld or on a lift truck, liquid loss can be held to a minimum.

HEAT SHIELDING GLASS KEEPS HOT SPOTS COOL

EXTENDED EXPOSURE of personnel to the intense heat emitted by radiant energy is a major problem faced by many industries.

Many methods have been developed for dissipating such heat. They include internal cooling, forced air drafting and shielding. Increased attention is being given the last. Where visibility is a requirement, an effective solution has been found in infrared reflecting glass.

A transparent film of metallic oxide, fire-bonded to one side of the glass, reflects the infrared rays which literally bounce off the glass panel. Effectiveness of the shield can be considerably increased by doubling or tripling the number of glass panels placed in a frame.

The panels are mounted in rubber-gasketed steel frames. The housing is designed for simple, quick and inexpensive installation. It permits plant crews to handle the installation job; specialists are not required. The crews work metal-to-metal. There is no necessity for working directly with the glass, a fact which eliminates a major obstacle to breakage-free installation.

Many Applications

An early application of the shields was in a rolling mill pulpit which was encased by them on three sides, replacing heat-absorbent glass. The mill reported a temperature drop of 34 F inside the pulpit during rolling operations. See Fig. 2.

The shields have also been used effectively as windows in steel mill cabs where operators manipulate the ladle controls. In one such installation, the temperature of the ladle outside the cab is 800 F. The operator works inside in a comparatively cool 80 F. These panels have held up, too, in face of splattering molten metal and flying slag and in two years use, there has been no breakage problem.

Light transmission through the heat shields ranges from 55 to 85 per cent, and after long use, this percentage is not materially reduced. The glass has high heat stability; it does not cloud or darken.

One of the most severe light transmission tests given the glass in actual use, has been in the television industry. Some 60 panels were installed in front of spot lights to shield performers from the great heat radiated from them. The shields were set at an angle of approximately 45 deg to the light source, thus reflecting the heat toward the ceiling and dissipating at least 50 per cent of it without losing the

Fig. 1. Heat shield protects worker during loading, unloading of furnace.

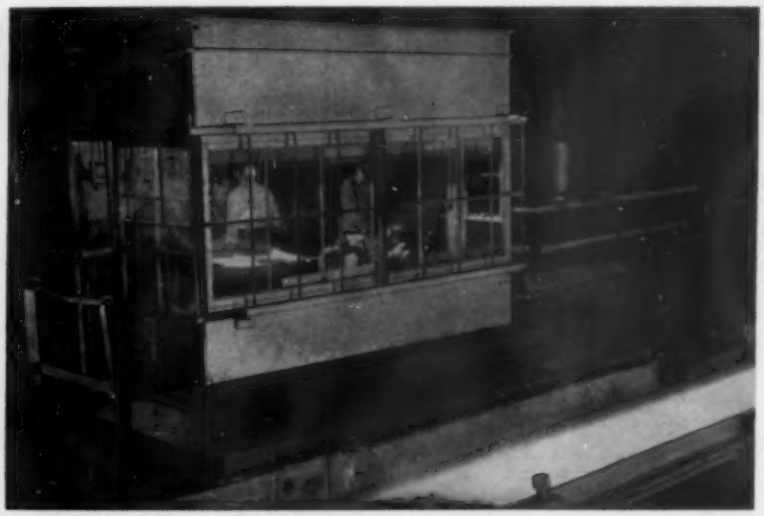


Fig. 2. Heat shields installed in steel mill pulpit reduce temperature in work area.

high level of illumination required. See Fig. 3.

Laboratories too have discovered the value of the glass heat shields. They protect delicate instruments against damage when, by necessity, the equipment must be placed adjacent to a high heat source. The shields safeguard personnel and eliminate inaccurate readings on delicate devices that can be thrown off by the radiated heat.

In one such application, several windows of the shielding glass were set in a wall separating melting furnaces from the control room. In this operation, constant visual control is important. Personnel must observe the furnaces and the instruments used in controlling the melting. Without the shield-out of the infrared, they would find room temperatures uncomfortable—even hazardous—and they would be plagued by instrument error. Use of the shielding glass here contributes to a temperature difference between the two rooms of up to 22 F. See Fig. 4.

The shields can be effective in many operations without elaborate installations. For instance, mounted on legs or a movable rack, the panels can protect workers loading or unloading furnaces. See Fig. 1.

In a fire polishing department in one plant, the shields have been set up so that the operator stands behind the glass which protects the upper portion of his body. He manipulates the control rods by reaching under the protective screen. **End**

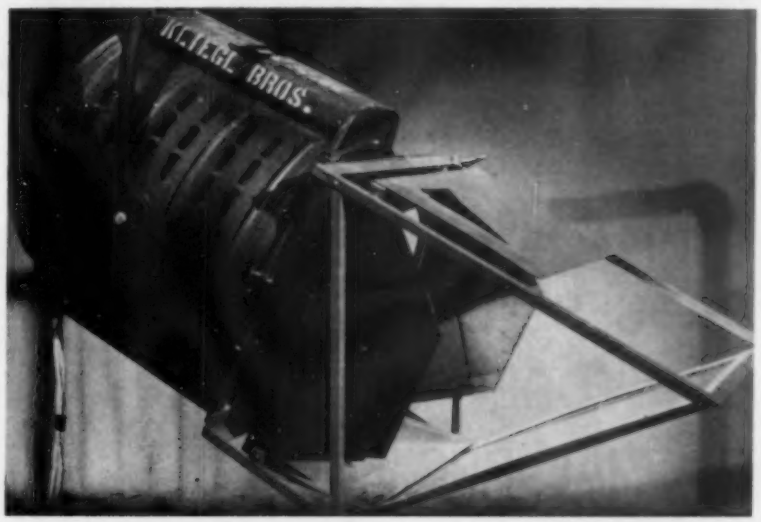


Fig. 3. Panel of reflecting glass cuts heat, allows high light transmission.

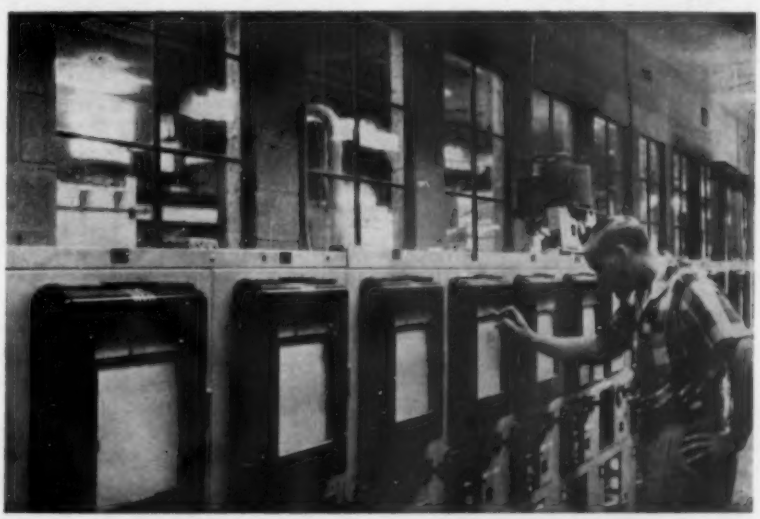
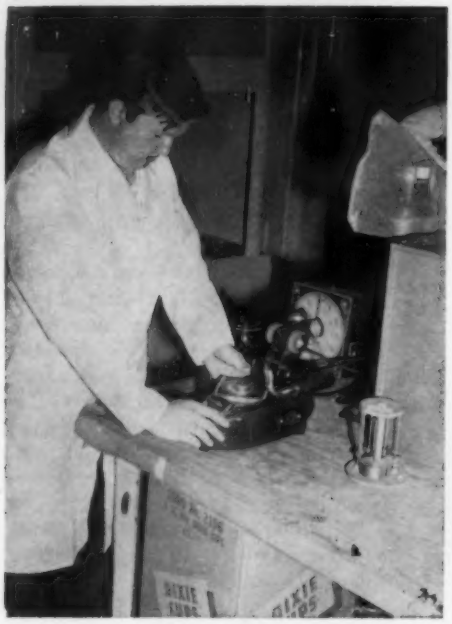


Fig. 4. Workers and delicate instruments are protected by shields used as windows.

Keith Russell, Plant Engineering Process Coordinator, discusses problem with R. A. Simpson, left, Chief Materials and Process engineer and, at right, C. C. Harrison, Assistant Chief Materials and Process engineer.

Abrasion test is run on this paint sample supplied by Plant Engineering.



PLANT ENGINEERING and PROCESS ENGINEERING GET TOGETHER ON SPECIAL PROJECTS

CAN THE PLANT Engineering department be of assistance to the Process Engineering department, and vice versa, despite a wide divergence of their normal activities? Is the highly specialized knowledge contained in each department interrelated to any practical extent?

At the Long Beach, California Division of Douglas Aircraft Company, where the DC-8 jet airliners are being produced, the answer is a resounding "Yes!" In fact, this possibility of mutual helpfulness is not only recognized, but is exploited to the n'th degree. The two departments work hand-in-hand on many projects and provide a beneficial interchange of advice on others. This cooperation has reached a status where one member of plant engineering specializes in process coordination and liaison between the two departments.

As pointed out by Keith Russell, the process coordinator, "Our tie-in with the Process Engineering department has been definitely beneficial. It has assured maximum effectiveness on many of the projects that the Plant Engineering department has been called upon to do. And I am sure that the advice we have often extended to Process Engineering has been just as helpful to them."

What makes this cooperation between the two departments even more outstanding from a common sense and practical viewpoint is the fact that many of the contacts between the two are not compulsory, but are accomplished simply because one department is willing to recognize the value of the specialized experience of the other. C. C. Harrison, Assistant Chief Materials and Process Engineer, points out, "We try to act as a service agent for Plant Engineering and they are free at any time to call upon us for the answer to a problem that falls within the category of our experience."

Kenneth Bingham, Manager of Product Reliability for the Long Beach Division, emphasized the importance of this cooperation by the following statement. "Product quality is depending less and less on final inspection, and more and more on the process controls and facilities used to produce it.

"In fact, many products now being produced defy final inspection except for visual appearance.

Honeycomb assemblies and bonded assemblies fail in this category. The only way to ascertain their strength is to test them to destruction. This means that the process controls and facilities used in their production must assure top quality without a comprehensive final inspection."

A summary of the chief areas of contact between Plant Engineering and Process Engineering at the Long Beach plant would include problems relating to material evaluation, design problems involving equipment which would subsequently be operated subject to process control, proper sequencing of operations, the development of specifications for equipment purchased by Plant Engineering and testing of purchased plant supplies.

C. C. Harrison points out that the specialists within his department are very helpful to Plant Engineering when it comes to problems of material evaluation. "We can often suggest materials that are cheaper, more resistant, or longer wearing than the materials Plant Engineering is planning to use. And sometimes we can help them avoid trouble by suggesting the use of a metal in place of a plastic component, or vice versa. At the same time, Plant Engineering often helps us by designing certain and required types of materials into specific processing equipment."

Develop Specifications

In many cases, Plant Engineering asks Process Engineering to develop specifications for facilities they are planning to build. This often results in considerable time and money saving when the facility is placed in production.

A typical example of this is the oven and conveyor used to dry DC-8 parts coated with fuel-resistant primer. Before the oven-conveyor combination was designed, Process Engineering established the minimum optimum drying time for primer when subjected to a specific temperature. This enabled the Plant Engineering department to minimize oven size, heat it, and adjust conveyor speed for maximum production without detracting from quality.

The same cooperation existed when Plant Engineering was called upon to purchase and install a huge quick-heat furnace for heat treating purposes. While writing up the specifications for this furnace, the plant engineers called upon Process Engineering for accurate data concerning the input necessary to meet temperature requirements, allowable temperature tolerances, recovery time, and various load characteristics.

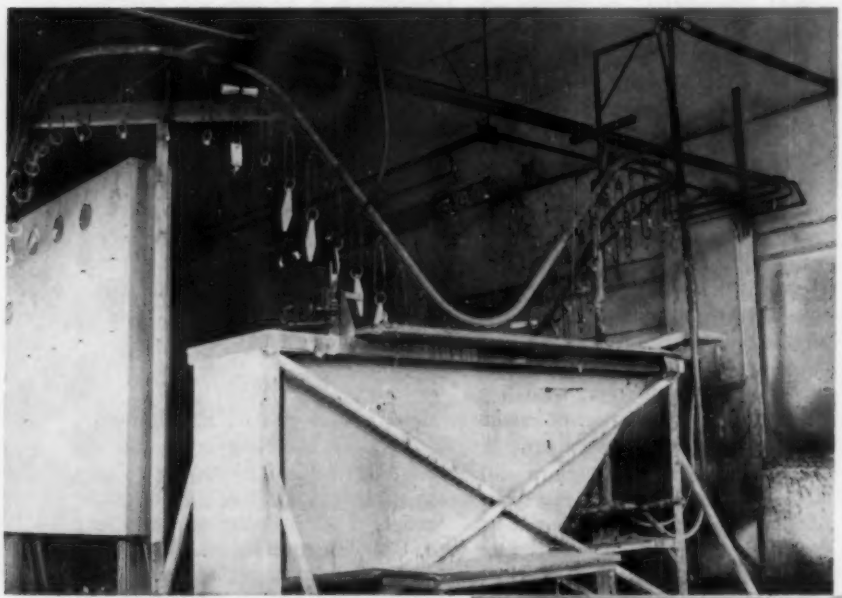
After the furnace was installed, process engineers cooperated with the plant engineers in the design of physical loading devices that would assure total and optimum heat treatment of all parts placed in the furnace.

It was pointed out that it takes extensive metallurgical knowledge combined with extensive design experience to come up with the right answers in an installation like this.

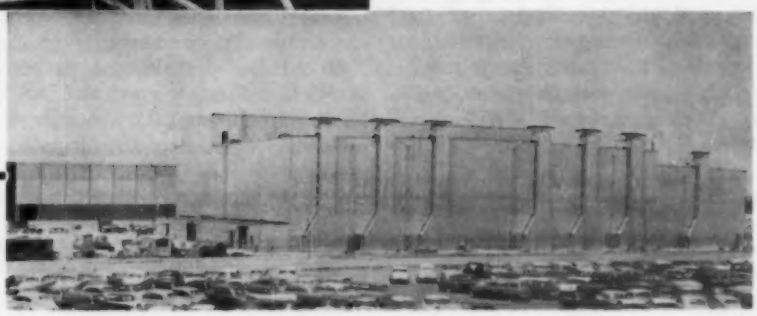
Many production processes especially those which are semi- or fully automated, require exact sequencing and timing. And it is not unusual for Plant Engineering to be called upon to design, or at least modify, the facilities employed in these processes.

When this happens, Plant Engineering calls upon the Process Engineering department for exact data concerning this sequencing and timing. With such exact data to work with, the design itself can often be simplified, or at least made to produce optimum results.

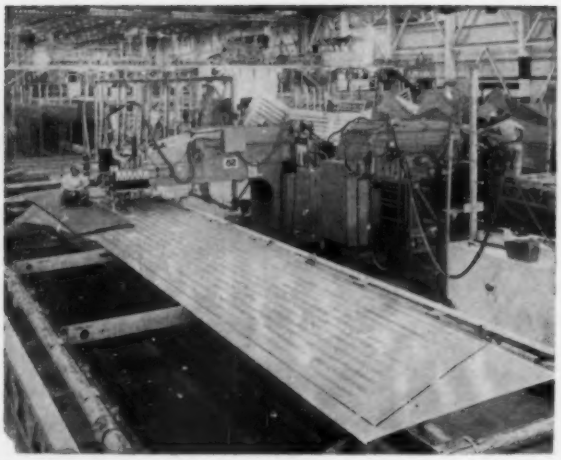
In conjunction with this, and speaking from experience, Keith Russell points out that while many



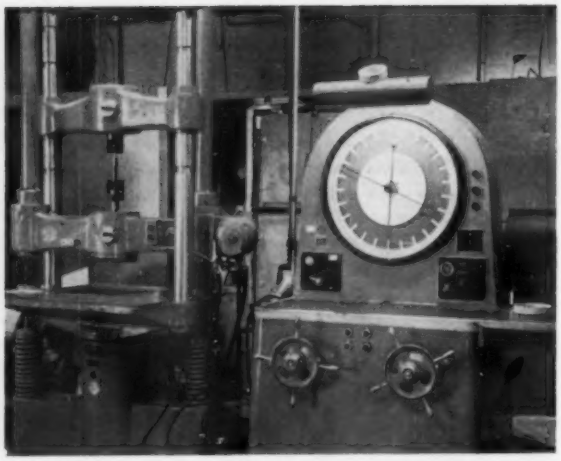
Above. Process Engineering determined optimum drying time for dip priming setup while Plant Engineering adjusted oven size, other variables.



Right, Plant Engineering controlled construction of paint facility, Process Engineering supplied data on equipment needed for environmental control.



Plant Engineering personnel modified and retooled riveter. Process Engineering designed slugs and jackets, ran tests.



Bar specimen for Plant Engineering is tested in the Process Engineering Lab where material evaluation is prime activity.

"outside" firms have extensive laboratories to test and establish approved usage of the product they are selling, this information, of necessity, must apply to average conditions.

Frequently, when an identical product enters the purchaser's plant, it is not used under average conditions. The deviations involved may minimize the value of the supplier's recommendations.

This is the reason that many products and supplies used by our Plant Engineering department at Long Beach are submitted to the Process Testing Laboratories for establishment of optimum application under the peculiar conditions existing at the Douglas plant.

Laboratory Tests

Factors affecting the supplier's recommendations might include the usage of lubricants at other than recommended temperatures, usage of a coating material for resistance to solutions not mentioned in the supplier's recommendations, unusual stress requirements, etc. But whether or not the item involved can meet these requirements can be quickly determined in the well-equipped Process Testing Laboratories.

The Plant Engineering department at Long Beach has found it expedient also to seek Process Engineering advice in collecting bid sources for many specialized materials.

If, for instance, such items as pins, loading racks, work hangers, etc., must be dip coated to protect them from a specific solution, Keith Russell contacts the Process Engineering chemical and plastics sections. The experts in these sections can usually suggest immediately a number of companies from which the required coating material is available, and with full confidence that it will serve the purpose for which it is intended.

To "turn the other cheek," so to speak, Process Engineering often seeks aid from Plant Engineering to design facilities which will meet Process-developed specifications. Such occurred when it was necessary to install a huge clean room for the assembly of components used to handle liquid oxygen. Process Engineering first wrote the specifications for this clean room, including specifications for consistent maintenance of cleanness in the room after it was in operation.

Working with these, the Plant Engineering department not only installed the clean room, but trained its own maintenance personnel to maintain cleanness in line with specification requirements.

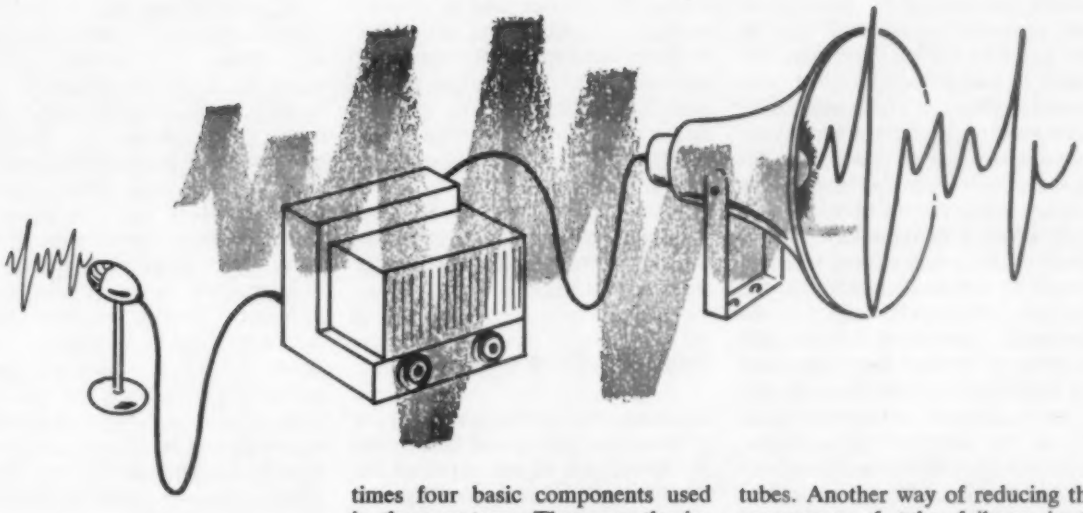
In all facilities devoted to the application of coating material, used for metal bonding, etc., where strict cleanness demands environmental control, Process Engineering first writes the necessary specifications, then Plant Engineering designs or installs in a manner to make sure that the specification requirements will be fulfilled.

It is not necessary to quote more examples wherein this close cooperation between Plant Engineering and Process Engineering has paid handsome dividends in time saved, and product quality. The above are sufficient to indicate to any Plant Engineer how he can use Process Engineering experience in many facets of his work. And as pointed out by R. A. Simpson, Chief Materials and Process Engineer for the Long Beach Division, "The success we have derived from our cooperative efforts with Plant Engineering seems to warrant the use of an "outside" testing laboratory in companies too small to maintain their own testing equipment and facilities."

Help Maintenance, Too

Needless to say and less unusual, the Process Test Laboratories stand ready and willing to check all plant supplies used by the maintenance section. This includes coolants for the Plant Engineering machine shop, paints used to recondition buildings and equipment, the many lubricants employed, and less standard maintenance supplies such as plastic coating materials for protective purposes, special machine-type hydraulic fluids, air filters, oil filters, etc. These items and supplies are tested just as carefully and with the same equipment that is used for testing the parts and supplies which will eventually become part of the new DC-8 jet airliner. **End**

INDUSTRIAL SOUND SYSTEM MAINTENANCE



Amplifier performance test, using audio oscillator, left, and a-c millivoltmeter, right, for measuring amplifier output.

INDUSTRIAL paging and intercommunication systems in many plants are poorly maintained and the resulting inferior performance is immediately obvious to visitors. Plant personnel get used to hearing a sound system and slow deterioration in performance is not often apparent to them.

A paging system is a simple affair and to keep it in peak operating condition is not difficult or expensive. There are three and sometimes four basic components used in these systems. These are the input device or microphone, or amplifier, and the output device or loudspeaker. In some systems there is also a control device to permit selection of several input or output devices or a standby amplifier.

Malfunction or deterioration of the amplifier is probably one of the most common troubles. Since most amplifiers used in industry are operating at least eight hours a day, if not continuously, heat is generated within the chassis. It is this heat that spurs the deterioration of amplifier components, hastens dehydration of electrolytic capacitors, warps insulating material and causes changes in values of resistors.

Visual inspection will often reveal damage done by heat. Some of the parts may be discolored and insulation on wires may be brittle. Charred resistors and capacitors from which insulating liquid or electrolyte has oozed should be replaced. The effects of heat can be minimized by keeping the amplifier free of dust and installing it where a draft will carry away the heat.

Defective tubes account for most amplifier failures. When replacing a tube, all the tubes should be tested since the others may be near the end of their useful life. Longer tube life can be obtained by replacing standard type tubes with long life tubes. Another way of reducing the annoyance of tube failures is to practice a form of group replacement. Many of the standard type tubes used in common amplifier circuits cost less than $1 and this is usually less than the cost of sending a man out to find the cause of a failure. Replacing all the tubes on one service call can reduce the number of subsequent service calls due to tube failures.

If your tube life is not up to manufacturers claims, it is possible that the line voltage is too high or subject to wide fluctuations. This can be remedied by installing a voltage regulator connected between the amplifier and the power line.

Some amplifiers are provided with a relay which cuts off the plate voltage but allows the tube filaments to remain energized when not in actual use. Removing the plate voltage stops emission in the tube thus prolonging filament life. The relay is controlled by the same switch, at or near the microphone, which is closed only when someone is talking into the microphone. Most amplifiers, however, are not equipped with a relay although one can be added easily to improve tube life.

Hum in a sound system is annoying and is often caused by the amplifier although it could be caused by the microphone or associated wiring. If the hum remains

when the volume control is turned down, it is a good bet that the amplifier is at fault. Hum is most often caused by dehydration of the electrolytic capacitors. This can be quickly determined by shunting a new capacitor across each one in the amplifier. Hum can also be traced to bad tubes, changes in the electrical values of components and sometimes by a state of unbalance between two tubes which are designed to work together and whose characteristics should be matched.

At times a high pitched tone is heard in the sound system which is caused by self-oscillation within the amplifier. This can be caused by defective components in the amplifier or external faults. Feedback from the loudspeaker feed lines to the microphone cable or improper loading of the amplifier through mismatched speaker connections can cause the amplifier to oscillate. Within the amplifier itself, dehydrated electrolytic condensers, changes in the values of components or defective tubes can be the cause.

Noise emanating from the loudspeakers can be caused by a defective microphone cable, or amplifier trouble. If the noise is present only when adjusting the volume control, then replace it with one of the same electrical characteristics.

Amplifiers can be tested at the point of installation or in the shop. Annoyance to plant personnel when making tests can be avoided by disconnecting the loudspeaker lines and connecting a dummy load across the output terminals. As an example, for a 50-watt amplifier connect a 50-watt, 500-ohm resistor across the 500-ohm output terminals. Four 20-watt, 4-ohm resistors can be connected in series across the 16-ohm output terminals. An a-c voltmeter is connected across the resistor to measure the output.

A test sound source can be obtained by having someone talk into the microphone but this may not be convenient. More useful information may be obtained by disconnecting the microphone and using an audio oscillator as the source of the test signal. The output of the oscillator is connected to the amplifier microphone jack through a resistive network, as shown in Fig. 1. Resistor R2 acts as a load for the oscillator. R3, in conjunction with the amplifier input circuit, forms a voltage divider to reduce the signal voltage.

Table I. Power in watts for various levels of voltages at output transformer.

Amplifier Output (watts)	Output Voltage 16-ohm tap	500-ohm tap
1	4	22
10	12	70
50	28	158
100	40	224

Amplifier Performance

Setting the audio oscillator to 1000 cycles per second and applying this signal to the input of the amplifier will tell how well the amplifier is performing by metering its output. In this test be careful not to overdrive the amplifier with too strong a signal. Table 1 shows the power output being delivered by a typical amplifier for various levels of output voltage. The actual power output capability of an amplifier may fall short of its rating when this test is made since the amplifier may have been rated on the basis of a voice or music signal whose average power may be less than that of the sine wave test signal.

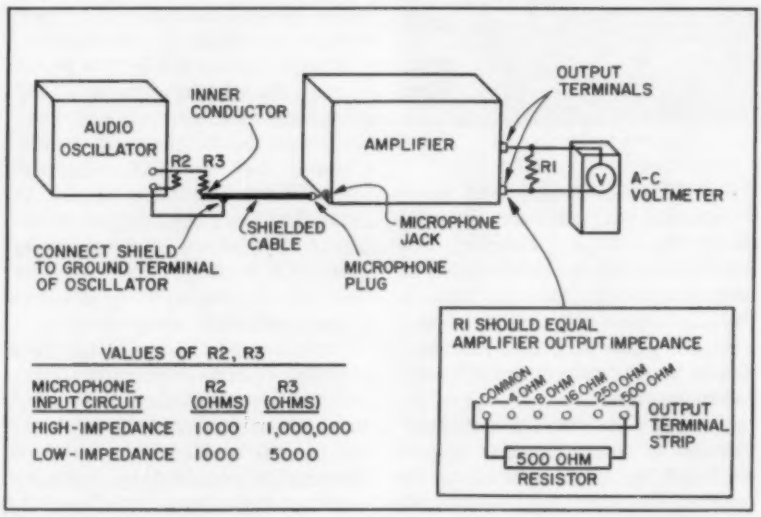
For music reproduction we may be interested in amplifier performance over a wide frequency range. However, in paging and intercommunication applications we are concerned with the reproduction of sounds ranging between 200 and 3000 cps.

A microphone is a delicate, pressure-operated electro-mechanical device that converts sound waves to a variable frequency a-c current. All microphones need proper care. Some are damaged when exposed for extended periods to warm sunshine. Others should not be used in windy locations or corrosive atmospheres. None should be subjected to physical abuse.

Microphone cables generally employ very flexible or even tinsel conductors plus a copper braid shield and can be a common source of trouble, particularly at the cable ends. Poor connections or shorting of conductors by frayed ends of the copper shielding material can occur. These troubles usually manifest themselves when the cable is moved.

An inoperative microphone may have an open coil, if of the dynamic type or a defective crystal, if of the crystal type. The latter when tested with an ohmmeter will indicate an open circuit whether the crystal is good or bad. A dynamic microphone may have a built-in transformer which will prevent measurement of coil continuity by testing the cable end. The quickest test for a suspected microphone is to try a new one. If the suspected unit is

Fig. 1. Connections for amplifier output test using oscillator and voltmeter.



VALUES OF R2, R3

MICROPHONE INPUT CIRCUIT	R2 (OHMS)	R3 (OHMS)
HIGH-IMPEDANCE	1000	1,000,000
LOW-IMPEDANCE	1000	5000

found defective, it should be sent out for repair by a specialist. It is often cheaper to buy a new one.

A loudspeaker is an electromechanical device that produces variable pressure sound waves from a variable voltage input. There are two basic types of loudspeakers in general use in industrial sound applications. The cone type, similar to those used in radio sets, is used mostly in offices and quiet locations. The horn type, in which a metallic diaphragm is used, is very popular in outdoor or high noise areas.

Cone type speakers must be kept clean and dry. The cone itself may become warped or torn and may need replacement. In the case of an inexpensive unit it may be cheaper to install a new speaker. Rattles in cone speakers are caused by dirt getting into the aperture in which the voice coil is suspended or by the voice coil making physical contact with the center pole or outer wall of the aperture. Dirt can sometimes be removed with a gentle air blast or with a pipe cleaner. Many speakers are furnished with screws that can be loosened to permit centering the voice coil in its aperture.

Most horn type speakers are of weather resistant construction. Since dirt can accumulate in the open spaces, they should be kept clean. If the finish has been damaged, it should be touched up with a compatible paint, plastic or varnish.

The horn driver unit may be built-in or an external type which can be screwed to the horn assembly. In case of trouble on an external type, the driver assembly can be replaced. When trouble occurs in speakers with built-in drivers, the entire speaker must be sent out for repairs or be replaced.

An inoperative speaker may have an open voice coil. This can be determined by measuring the resistance across the voice coil terminals.

In many installations a line transformer is used at speaker locations to avoid excessive power losses in the feed lines. Such transformers, if protected from the elements, seldom give trouble. However, an internal short can greatly impair operation and an open winding will obviously prevent operation of the associated speaker.

When loud speakers are less than 100 ft from the amplifier, a low impedance feed is feasible. The speakers are connected directly to the line without a line transformer and the other end of the line is connected to the low impedance terminals of the amplifier.

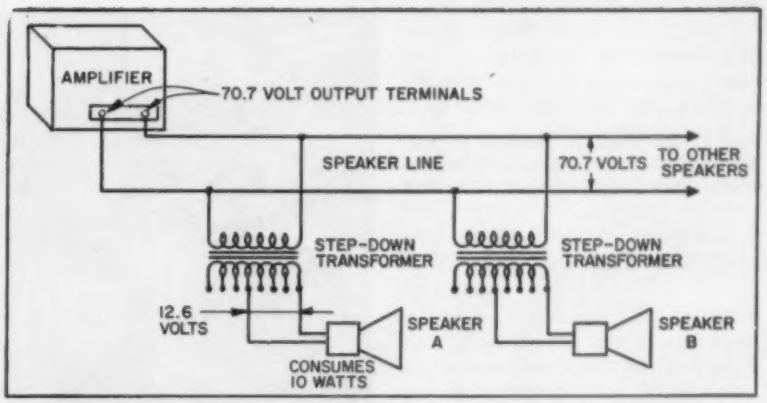


Fig. 2. In a constant level speaker feed system, the volume level of each speaker is set by selection of taps on the secondary of the line matching transformer.

Longer lines require the use of line transformers at each speaker location to provide a match from the high impedance line to the speaker voice coil. The lines are fed from the high impedance output terminals of the amplifier, generally 500 ohms.

Impedance Relationships

When a system is initially installed, the engineer plans the loudspeaker feed circuits so that the desired impedance relationships are maintained. These relationships should not be disturbed. When a loudspeaker is removed from the circuit, a resistor of the same ohmic value as the speaker impedance should be connected in place of the speaker so as to maintain the correct impedance balance.

Adding a new loudspeaker may also disturb these impedance relationships and it may be necessary to readjust the line transformer taps at other speaker locations. The amplifier is actually an a-c generator and its load impedance may be higher than the amplifier impedance. As an example, a load whose impedance is 600 ohms may be connected to the 500-ohm output terminals, but a 400-ohm load should not be connected to the 500-ohm terminals. This load, however, can be connected to the 250-ohm terminals if the amplifier is equipped with them.

Maximum efficiency is achieved when the load impedance matches the amplifier impedance. Hence, a 500-ohm load connected to the 500-ohm terminals provides maximum efficiency. A mismatch such as caused by the application of the 400-ohm load to the 500-ohm terminals can cause distortion and affect amplifier operation. A mismatch in the other direction reduces efficiency in that the full rated output on the amplifier will not be available.

Your sound system may have another speaker feed technique now in wide use that is not concerned with impedance matching. Instead, the speaker feed lines are looked upon as power lines. Line transformer turn ratios, at the speaker locations, are selected upon the basis of voltage, not impedance. The output of the amplifier is fed to the lines at 70.7 volts. Speakers are bridged across the feed lines through step-down transformers. In this system, speakers may be added or removed without requiring adjustment of transformers at other speaker locations.

Testing this system is relatively easy. The signal level on the line when speech is being transmitted is in the order of 70 volts. The volume level at each speaker location is preset at the time of installation by adjustment of line transformer taps. For example, if a 16-ohm speaker is connected to the 12.6-v tap on the line transformer secondary, Fig. 2, the loudspeaker will consume about 10 watts. This is computed with the formula in which watts is equal to the voltage squared divided by the resistance. **End**

Fig. 1. Numbers on barrels, drums, guns and oil cans show coding used to insure correct application of lubricants.

LUBRICATION "BY THE NUMBERS"

Coded Plastic Tags Instruct Lubricators

By G. E. CHAPMAN, General Foreman, Maintenance, Westinghouse Electric Corp., Athens, Ga.

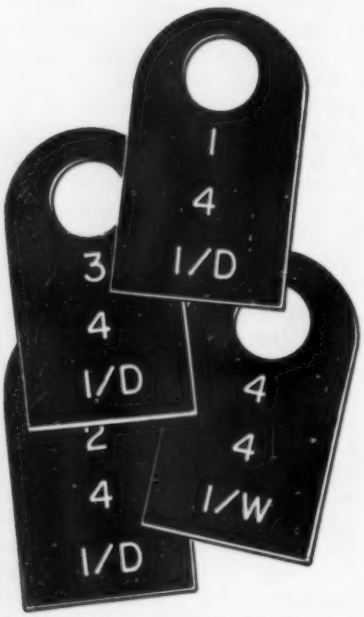


Fig. 2. Plastic tags show lubricant point number, lubricant code number and frequency of lubrication at each fitting.

LUBRICATION of all equipment in our plant is the responsibility of the equipment operators, except for mobile equipment, conveyor systems, roof ovens and equipment incorporated in the building . . . such as rolling doors, exhaust and make-up air fans. These exceptions, considered integral parts of the building itself, are lubricated by a maintenance oiler.

Unfortunately for the lubrication program, there is a continual rotation of operating personnel in the plant. This makes it necessary to have a simplified lubrication program that does not require lengthy instructions each time an employee moves from one job to the next.

We started building our program by minimizing and standardizing the number of different types of lubricants. We listed half a dozen lubricants that we knew would be used in relatively large quantities and submitted these lists to several suppliers for quotations. After the quotations were compared we asked the lowest bid supplier to furnish us with lubrication engineering services to make a comprehensive survey of our plant's needs. Any of the large lubrication suppliers will furnish engineering services free of charge.

Upon the completion of this survey we compiled a list of lubricants which became our standard list of lubricants. These were numbered consecutively, starting with one. This minimized the number of lubricants and did away with trade names as well as lengthy Purchasing Department specification numbers.

To assure ourselves that the correct lubricants were prescribed by the supplier's engineers for each machine and to continue our simplification program, we requested each engineer responsible for specifying equipment to:

1. Number, with white paint, all

AO No. 10360	MACHINE DESCRIPTION		#3 Universal Class. Milling Machine			
Part Description	Lub. Point No.	Type of Lub.	Frequency	Application Method	Amount	Remarks
Left end lead screw bearing	1	4	1/D	OC		
Right end lead screw bearing	2	4	1/D	OC		
Knee column vertical way	3	4	1/D	OC	Fill Cup	
Spindle drive & column pads	4	4	1/W	OR	2½ gal.	Maintain level
Overarm pilot wheel bearing	5	4	1/W	OC		
Knee column vertical way	6	4	1/W	OC	Fill Cup	
Universal head bearings	7/9	1	1/W	FF		
Universal head bearings	10/11	1	1/W	FF		
Universal head bearings	12	1	1/W	FF		
Universal head drive assembly	13	3	1/W	OR		
Table Bijur Oiler	14	22	1/D	OR	1 pt.	Maintain level
Reservoir vertical screw	15	22	1/W	OR		Maintain Level
Machine Lubrication Specification: Dist. Trans. Div. Westinghouse Electric Corp., Athens, Ga.						

Fig. 3. Lubrication chart for milling machine carries complete lube "story."

of the lubrication fittings on the pieces of equipment for which he is responsible. Numbering the fittings so that an employee's time would be minimized in lubricating the equipment if he follows the numbers consecutively. Minimizing the amount of moving from one fitting to another and the amount of switching from one lubricant to another.

2. List these lubrication point numbers and prescribe a lubricant, and frequency for each, with the equipment supplier's assistance.

3. Design better methods of lubricating hard-to-reach fittings. For example: extend fittings through guards and eliminate the need of removing these guards for lubrication.

These lists of lubrication points, lubricant trade names, and frequencies were compared with the lubrication supplier's survey and a summary lubrication chart similar to the one shown in Fig. 3 was made out for each piece of equipment. Four copies of the chart were made for each piece of equipment and distributed:

1. First copy was put into a celluloid envelope and attached to the equipment for the employee's use.

2. Second copy was given to the factory section foreman for his review and file.

3. Third copy was given to the engineer responsible for ordering the equipment for his review and file.

4. Fourth copy was filed in the maintenance office.

The next step of our program was to permanently mark each fitting on the machines; the numbers painted on by the engineers would only last until the next paint job. We found that the easiest means of marking these fittings was the use of a plastic plate, 1 in. wide, 1¾ in. long, shown in Fig. 2. The hole in the plate is large enough to screw a grease fitting through, but not large enough for the hex of the fitting to fit through. The lubrication point number, lubricant code number, and frequency code are engraved on each plate. Oil reservoirs and holes were labeled with the same engraved plastic plates, but the plates were fastened to the equipment with small sheet metal screws.

The next phase of our program was to make sure that proper lubricant-handling equipment was available and was being used properly. Most lubricants are received in 55-gal or 400-lb drums, which are coded by the Receiving Department and placed in main stores. The Maintenance Department requisitions these drums as needed and moves them to the Maintenance storeroom.

The lubricants are then pumped from these drums into closed containers mounted on wheels and fitted with individual pumps. These containers are taken to the different production sections throughout the plant and grease guns, oil cans, and oil reservoirs are filled from them.

All these containers, including the hand grease guns and oil cans, have their respective lubricant code marked on them. Whether or not the correct lubricant is being transferred at any stage can be clearly observed by the employee, other employees, engineers, or supervisors. Lubricants are never exposed to the open air; consequently, contamination of lubricants is minimized.

Considerable time and effort were put into the preparation and implementation of this system; on the surface, it may seem excessive. However, with the knowledge that the equipment will be in use for years, and the personnel operating it will be rotated continuously, a thorough program seemed the most economical approach. **End**

Fig. 4. Tags are mounted directly on lube fittings for guidance of machine operator.

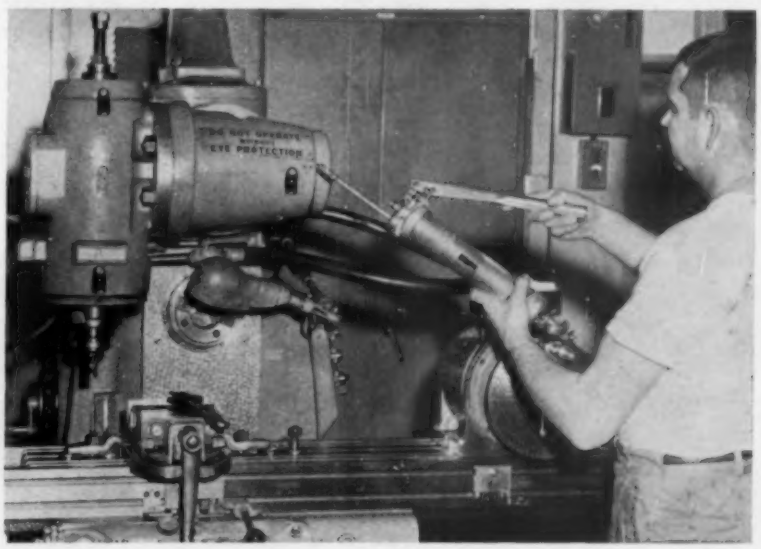


Fig. 1. Outline of the cantilever construction and typical column supports can be observed at the side of the building.

ROOF GIRDERS CANTILEVER FROM CORE

ENGINEERING ingenuity and architectural creativity are combined strikingly in a massive hangar which United Air Lines has constructed at San Francisco for turnaround maintenance of DC-8 Jet Mainliners.

The hangar is within a mile of the maintenance base at which United's piston-engine and jet aircraft undergo major overhauls. Turnaround maintenance is the airline term for the mechanical servicing planes receive at terminal points where they "turn around" for the return trip.

The turnaround maintenance hangar is a double cantilever structure, 310 by 363 ft. It has a three-story "core" enclosed by 14 columns of reinforced concrete. The columns support seven steel plate girders—the largest ever made in this country. Each is 365 ft long and weighs 125 tons.

The girders cantilever 142 ft beyond each side of the core, which is 81 ft wide with walls of masonry concrete. The core contains offices, shops, storerooms and equipment for heat and ventilation. Total floor space, including the core, is 154,000 sq ft. The concrete slab on which the jets park is 15 in. thick, and it is large enough to accommodate four DC-8s and two DC-7s. Outlets for gas, oil, air and electric power are available at each parking position.

United's vast hangar is heated by radiant floors. Fire protection is provided by a deluge sprinkler system, with each unit designed to sprinkle an area 50 ft wide between the roof trusses. A temperature rise of more than 10 deg in two minutes will automatically trigger the sprinkler system.

The hangar door consists of four sections, each 50 ft high, 77 ft wide and weighing 15 tons. The door is operated electrically by pushing a button located on its leading edge. A mechanic must walk along with the door because the current will shut off if he takes his hand from the button. As an additional precaution, the door has a safety edge which cuts off the current when an object is encountered. **End**

Fig. 2. Light fixtures can be lowered.

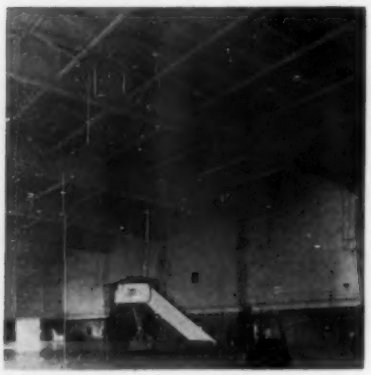


Fig. 3. Girder length is about 365 ft across; each overhang is about 142 ft.

SEALED RADIOACTIVE CARRIERS LOCATE LEAKS

By WALTER KERWICK, Plant Engineering Section, and
ROBERT E. BLACK, Radioisotope Section,
General Motors Research Laboratories, Warren, Michigan

LOCATING LEAKS in pipes by the use of radioisotopes has been known for many years. In the past, the radioisotopes have been in a solution form, so that mixing with the normal contents of the system could occur. However, a different method of locating leaks in underground water pipes by the use of sealed radiation source has been developed and used successfully by General Motors Research. In this method the activity does not come into contact with and is not dissolved in the water. This simplifies leak location.

The carrier technique was first tried out at the Chevrolet Transmission plant in Saginaw, Michigan. The dissolved source technique was also used to check on the results obtained with the carrier. This provided an excellent opportunity to compare the two techniques as to cost, time, and ease of use.

Piping sizes in the salvage water line vary from 3 in. to 10 in. in diameter. The pipe is covered with from 15 in. to 27 in. of earth and sand fill, and a 9-in. thick concrete slab. The salvage water line is 410 ft long and has an estimated capacity of 900 gallons. It normally operates under a 5 psi head.

In using the sealed source method, the carrier, containing 30 millicuries of Na^{24}, was dropped into a cleanout in the line under test and flushed into the main line. All normal exits from the line were closed, and all normal inputs were closed except for one just behind the sealed source. It was a simple matter for men equipped with Geiger counters to follow the progress of the sealed source through the line.

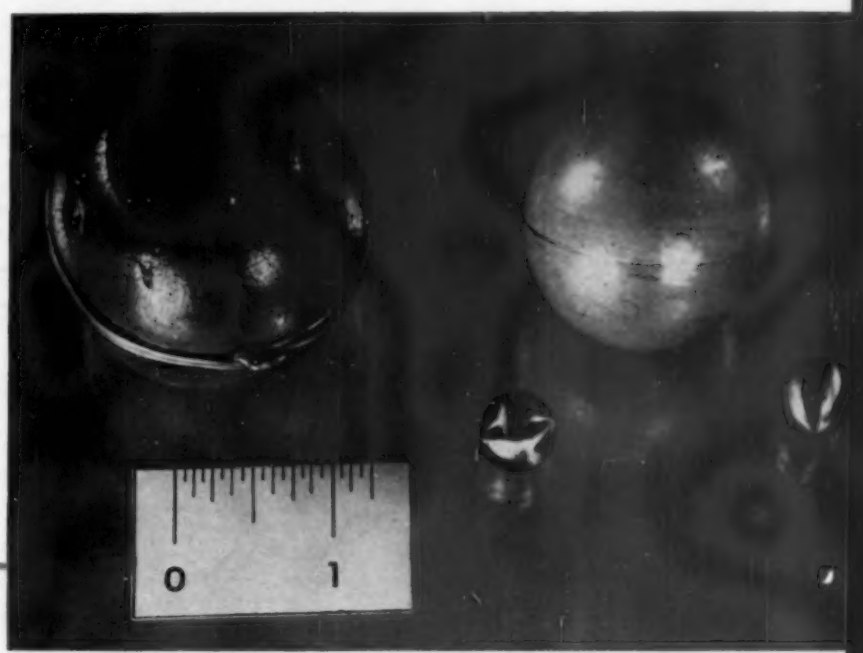
The source was observed to stop at two points. The system shut-off valve was opened, and the source was swept out into the reservoir. It was placed in the line again, and was traced through the line with similar results.

To locate the leaks with the dissolved source, a dissolving and injecting apparatus was connected to the line. All normal exits from the line were closed, and the line was filled with water. Water was fed into the line to replace that flowing out of the leaks, and the pressure in the line remained constant. About 300 millicuries of Na^{24}, as Na_2CO_3, were dissolved and injected into the line.

The motion of the radioactive solution was followed with Geiger counters, as had been done with the sealed source. Residual activity was observed, after the radioactive solution had passed, at all points at which the sealed source had paused or stopped.

Excavation revealed leaks at all of the points which had been indicated by the tests.

Because of the dissolved radioactive solution all persons in the area wore dosimeters. Air samples



The sponge ball, left, was the first sealed carrier we used. Steel spheres, right, are improvements of this idea.

were taken around all unloading, handling, excavation and processing operations to insure personnel safety. A final survey of the area revealed that there was no contamination, and so the production schedule of the plant was not disturbed.

Time required on the site for preparation and performance of the two tests with the sealed source was about three hours.

The carrier method has certain advantages over the solution technique. The radioisotope is enclosed in an envelope or carrier and the total weight of the carrier and isotope is approximately equal to the weight of the water or liquid displaced. For best results, this carrier should be rigid so the specific weight will not change appreciably.

Advantages of this method are:

1. Since the radioactive material is contained in a sealed sphere, it is easier to handle.

2. The carrier can be recovered and tests can be repeated to pinpoint a leak.

3. The activity does not come into direct contact with water and therefore does not contaminate it.

4. A smaller amount of activity is required.

In the dissolved source method, a large amount of radioisotope is placed in the system. The radioisotope source is diluted and may be washed away. However, a sealed source is not subject to dilution, and so it is much easier to trace its movement. This enables one to use a much smaller amount of radioisotope for a given job, which simplifies the procurement, shipping and handling of the source.

The sealed source can usually be put into a system through a clean-out, or a tee. A dissolved source, however, requires a dissolving apparatus (since the radioisotopes as received are in solid form) and an injecting apparatus. The sealed source is easier and cheaper to use, in this respect.

When a large amount of dissolved source is placed in a water system, all of the water which leaves the plant must be monitored so that one is sure at all times that a dangerous amount of radioisotope is not released into the community. This precaution is usually unnecessary when a sealed source is used, for two reasons: the sealed source can be tested for radioisotope loss before the leak test is performed so as to avoid putting a faulty source into the system, and even if the source were to be accidently broken open while in the system, the amount of radioisotope in the source would usually be too small to cause a dangerous concentration.

The carrier method was used successfully in locating two leaks in the snow melting system outside of the Research lobby.

First Leak Located

The first of these leaks was located in the sidewalk where the 1¼-in. pipe was covered with three inches of concrete. Source used was approximately 0.5 millicurie of Cobalt 60 in a ½-in. diameter stainless steel ball. Other leaks were under the street where the pipe is covered with three inches of concrete and two inches of asphalt. For these leaks an additional 4.5 millicuries were inserted into the ball making a total of 5 millicuries for the source. The ball was retrieved and run through from opposite ends to pinpoint the leaks.

The first carrier we used in the sealed radiation source technique was a sponge rubber ball. The activity was placed in a plastic cylinder about ¾ in. in diameter and 1¼ in. long. A hole was punched through the 1½-in. ball and cylinder was inserted in the hole. Solder wire was then wrapped around the ball for ballast. Although this carrier functioned properly on the inital test, difficulty to keep it suspended due to its ability to absorb water became apparent.

Tests were later conducted on a simulated leak test stand and the results of these tests used to design two new carriers.

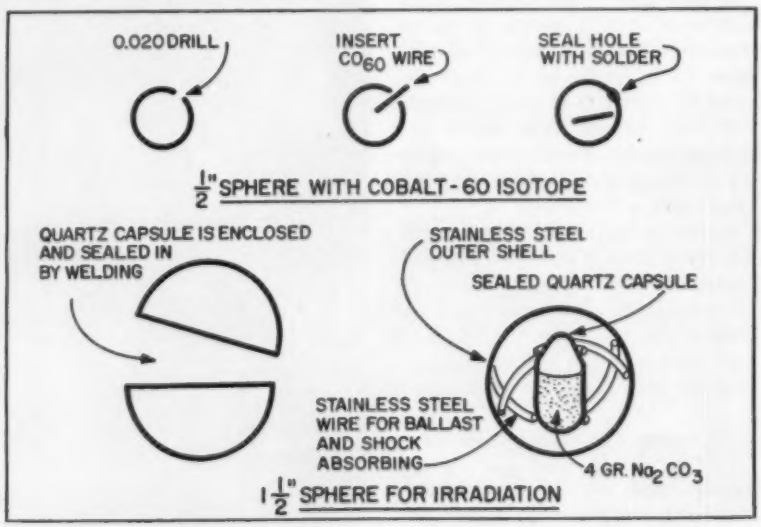
The first of these was a ½-in. diameter stainless steel sphere for small diameter pipes. Two hemispheres were formed out of 0.010-in.-thick stainless steel, silver soldered together and a 0.020-in.-diameter hole drilled in the sphere.

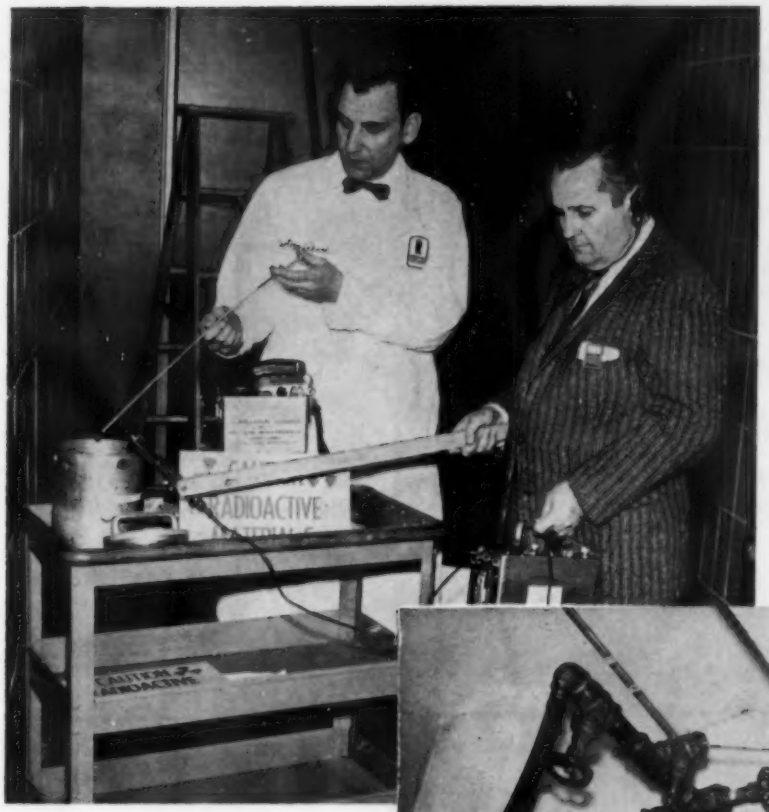
A Cobalt 60 wire of proper length was then inserted through the hole and the hole was sealed with solder. Since Cobalt 60 has a half-life of 5.2 years the sphere has to be stored in a lead container when not in use.

The second type of carrier was a 1½-in. stainless steel sphere. The first step was to form two hemispheres using 0.010-in. stainless steel. A material that can be easily irradiated in a reactor was selected, in our case sodium carbonate (Na_2CO_3) was used.

When this compound is bombarded with neutrons, some of the sodium 23 atoms become radioactive sodium 24 atoms. Four grams of sodium carbonate were sealed in a quartz capsule. This capsule was wrapped with stainless steel wire and sealed in the two spheres by inert atmosphere arc welding.

Sketches show the two radioactive carriers which were developed at the General Motors Research Labs. We are presently using these carriers to detect leaks.


0.020 DRILL
INSERT CO_{60} WIRE
SEAL HOLE WITH SOLDER
½" SPHERE WITH COBALT-60 ISOTOPE
QUARTZ CAPSULE IS ENCLOSED AND SEALED IN BY WELDING
STAINLESS STEEL OUTER SHELL
SEALED QUARTZ CAPSULE
STAINLESS STEEL WIRE FOR BALLAST AND SHOCK ABSORBING
4 GR. Na_2CO_3
1½" SPHERE FOR IRRADIATION



Left: Stainless steel sphere, containing Cobalt 60, is removed from the pig.

The radioactive carrier is then placed in the pipe of the snow melting system.

With use of Geiger counter, carrier is located, indicating where leaks occur.

When the sphere is to be used, it is sent to a reactor station and irradiated to meet only the requirements of the specific leak detection problem. The activity required is based on the transportation time, depth of pipe, kind of material the protons must penetrate and the length of time the test will be conducted.

Sodium 24 has a short half-life of 15 hours and in 4½ days it will lose most of its activity. Two advantages of this are: 1. The sphere can be reactivated to the proper value to meet any future leak detection problems. 2. The sphere can be stored with a minimum of shielding.

The carrier method is a clean way to locate leaks in buried piping and has proved effective in practice. However, this method has one limitation and that is that it will not work well on locating very small leaks in large diameter pipe. The reason for this is obvious, since the flow of liquid to and out of the leak would not have enough momentum to carry the radioactive ball through the pipe in a reasonable length of time. **End**

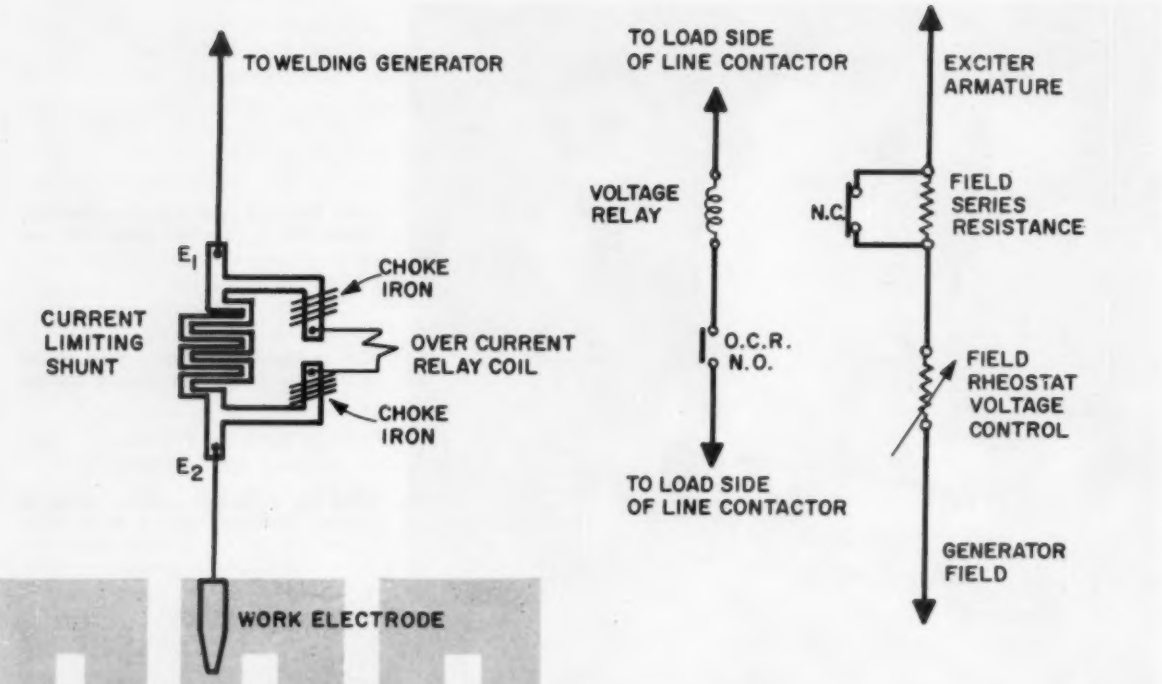


Fig. 1. Diagram of shunt and interlock circuit shows how to recognize difference between starting and welding current.

SHUNT LIMITS CURRENT— PREVENTS BURNED WELDS

By WALTER JACOBY, Maintenance Supt., Special Products Div. I-T-E Circuit Breaker Company, Philadelphia, Pa.

THE NECESSITY for controlling the maximum welding current in arc or heliarc welding is evident in the amount of burned and cracked work created by operators who raise welder output beyond approved settings in an attempt to increase work output. Often, the number of jobs rejected for these reasons warrants the installation of current level controls to assure welding at constant currents.

Supervision is accomplished by an overload relay that senses an overload condition and eliminates welding voltage as long as the welding current exceeds the desired level.

However, the striking inrush current to the work when starting a weld must not cut off welder supply, or the result is of course, no welding voltage.

To distinguish between arc starting current and welding current, a device must be capable of sensing the difference between the characteristics of each.

This is quite difficult to recognize electrically as voltage and current control found on arc welders enable the operator to cover any voltage and current pattern shown between the curves A and B shown in Fig. 3. Curves C and D indicate the vast combination of volt-ampere curves that can be produced, varying from the rather shallow curve C to the steep curve D.

In spite of the wide variable in volt-ampere characteristics of d-c arc welding generators, the inrush current to work is still slightly higher than weld current. This starting current is not high enough to create a definite distinction between the starting and welding current. The big difference is, however, that the starting current is accelerating very rapidly; the weld current is steady. The principal advantage is the fact that the acceleration of current can produce inductive reactions while the steady welding current does not.

Figure 1 shows the method of recognizing schematically the difference between starting and welding current. Once determined, the machine output voltage can then be cut off in the event an operator attempts to weld at a higher than preset current.

The operation of the arc welding current limit shunt control is as follows:

Looking at Fig. 1, the current

limiting shunt, referred to hereafter as the shunt, is connected in the electrode lead of the generator circuit as shown.

The shunt is so cut in cross sectional area, that normally 60 per cent of the welding current flows through the side in which the overcurrent relay is connected. The remainder of welding current flows through the main leg of the shunt, at E_1 E_2.

The relay side of the shunt is loaded with choke iron. Normally, welding current does not trip the overcurrent relay unless welding current exceeds the setting of the relay plus the main shunt leg current. The division of current between the shunt legs is a function of the d-c resistance of the shunt legs when steady weld current flows.

To overcome inrush current when starting a weld so as not to trip the overcurrent relay, the choke iron chokes the inrush current during current acceleration period and crowds the bulk of the starting current through the main E_1 E_2. Overcurrent relay does not then operate during the striking period as the acceleration of current creates enough inductance in the relay leg to overcome the starting current.

When normal weld current is established, the shunt will recognize any increase in current due to excessive settings of voltage and current controls. Figure 1 is a schematic diagram of the shunt and associated parts.

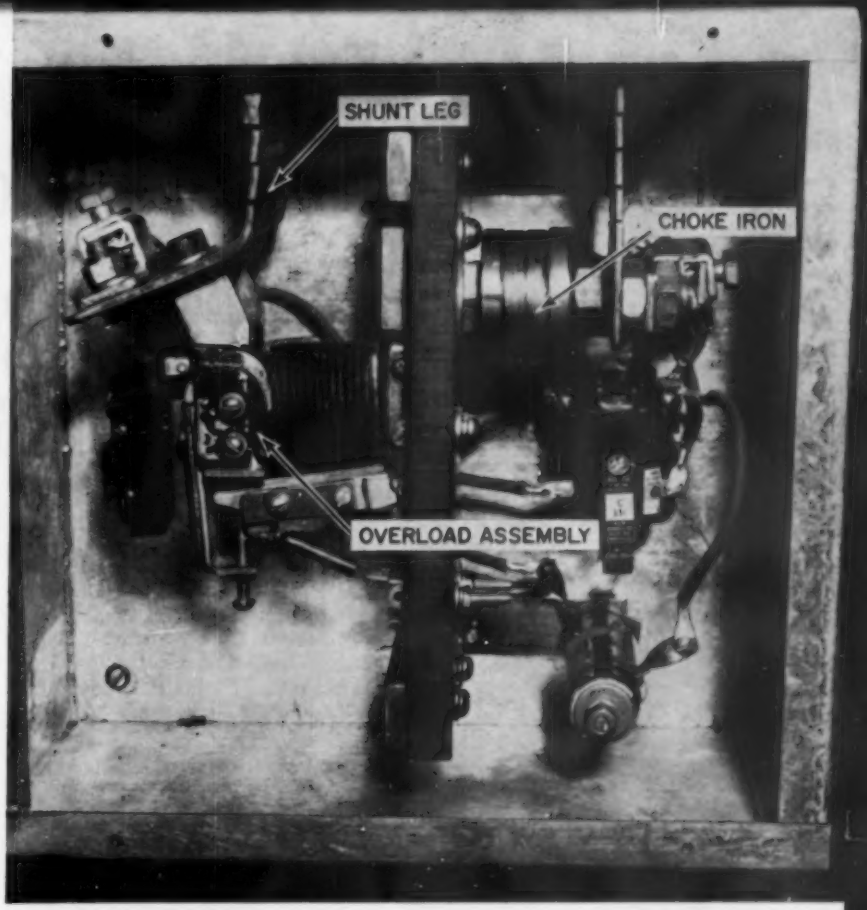


Fig. 2. Shunt mounted and connected to overcurrent relay coil. Note choke iron.

When the overcurrent relay operates, it energizes the voltage relay which completes the control circuit. Which is fed from the load side of the motor starter that drives the welding generator. The normally closed contact on the voltage relay opens, inserting additional resistance in series with the generator field, thus reducing the generator output and therefore cutting off welding current.

Welding current cannot flow unless the operator returns his control settings to or below the set current level.

Current levels are determined by the manufacturer's recommended currents for various types of metal.

Figure 2, the overcurrent relay, shows the shunt mounted and connected to the overcurrent relay coil.

The four standard sizes of arc welders are 200-, 300-, 400-, and 600-amp.

One shunt is used for each frame size. The capacity of each shunt is adjustable through the relay side of the shunt. **End**

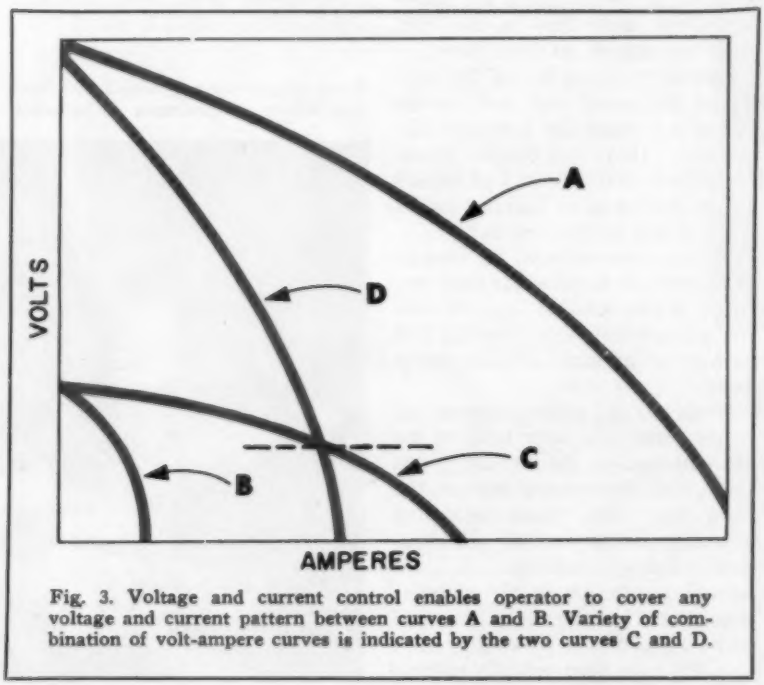


Fig. 3. Voltage and current control enables operator to cover any voltage and current pattern between curves A and B. Variety of combination of volt-ampere curves is indicated by the two curves C and D.

Dr. Grabow PUTS DUST IN ITS PLACE

No vacuum problem, now. And, it's all due to a central dust collector system. Maintenance costs reduced 15 per cent . . . plus a fuel savings of 25 per cent

JUST ABOUT EVERY operation in the manufacture of Dr. Grabow Pre-Smoked pipes creates dust in some form and requires ventilating. From 1949 to last year each machine at the plant of Sparta Pipes, Inc., Sparta, N. C., was individually ventilated to a common duct that carried the material to an open wooden dust bin outside the plant.

This system created a tremendous suction throughout the plant. Doors were hard to open against the pressure caused by the evacuation of hundreds of thousands of cubic feet of air every minute. Doors would slam and sometimes break. If a window were opened in an office, every loose paper would fly off the desks, air would come into the building through every crevice around doors and windows and bring dust with it from the open collecting bin.

Most serious problem occurred during rainstorms because water would seep into the building, covering parts of the floor, rotting the window and door jambs, and, on a few occasions, shorting circuits in the wiring and causing the plant to be closed for the day.

The Wheelabrator Collector, a cloth tube type collector, which recirculates air through the plant after it has been cleaned, has overcome this problem of vacuum and the problems it in turn was causing.

The water problem has been eliminated since there is no longer a vacuum. This has reduced repair and maintenance costs by at least 15 per cent and has eliminated damage and downtime caused by water seepage.

Another significant improvement has been realized during the heating season, from September to the end of April. On very cold days, the furnace ran 24 hours a day, using 13 gallons of oil per hour. Since this was not enough, the company installed electric overhead heaters, but even this was insufficient because everyone working near the windows was chilled by the drafts of cold air from the outside, in spite of the fact that they worked with their coats on.

With the new central dust collector system, the warmed air in the plant goes into the unit, is filtered and quickly returns without losing much of its heat. It is distributed to all three floors. There are openings every eight feet in the vent pipes on each of the three floors.

Instead of being hot in the center of the room and cold at the edges, the warm air is evenly distributed. They no longer pump 200,000 to 300,000 cu ft of heated air per minute to be wasted outside. They re-use it, over and over.

In zero weather now, the furnace is on only 15 minutes per hour and in 30 degree weather, it is on only five minutes per hour, bringing fuel savings of at least 25 per cent a year.

With the old venting system, air in the plant was dusty because the air surrounding the building was laden with dust being blown into the open bin. This meant unhealthy working conditions and added to housekeeping problems. It also slowed production in the shipping department because every piece had to be wiped before packing.

Costs have been radically reduced in disposing of the waste. Before, a man was hired to shovel out the bin into a truck. With the present system, the hauler simply drives under the dust collector hopper, pulls a lever and the waste is dumped. The three hoppers are emptied weekly in three truckloads in 45 minutes instead of the previous five hours.

A brief description of the processes involved in the manufacture of Dr. Grabow Pre-Smoked pipes leaves no doubt as to the necessity for a good ventilation system.

After blocks of imported briar are removed from the drying room (where they are kept at 90 F), the upper half of the block is turned on a lathe to give the particular shape of the bowl being produced and the tobacco hole is bored.

Hood around buffing wheel and vent pipe direct contaminants to collector.

The lathes performing this operation, like all lathes, grinders, sanders and polishers in the two buildings at this plant, are outfitted with a 3-in. or 4-in. metal duct which is funneled and shaped at the top to fit around the wheel or drill in order to catch all dust or shavings given off in the process.

After the upper half of the bowl is turned, lathes shave the bottom half and the shank. In the rough sanding operation, sanders remove the machine marks. When the shank has been cut to length, drillers bore the bit hole while two men turn the plastic and rubber bits to size. An air hole is then drilled through the shank to the bottom of the bowl. When the bits have been assembled to the bowls, sanders rough-shape the shank to the size of the bit.

The bowls are then fine sanded. After the bowls are stained any of eight different colors, the pipes are buffed with abrasive wax, removing any excess stain. The inside of the pipe is cleaned by blowing it out with 100 lb of air pressure and then all the aluminum fittings are buffed.

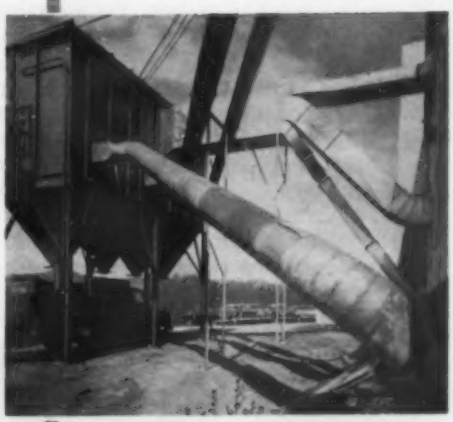
A separate operation that Dr. Grabow pipes go through takes place in the smoking room. The bowls are fastened onto air nozzles which are attached to one-inch metal pipes with an air pump at the other end.

The smoking machine will hold many dozens of bowls at a time. After they are filled with tobacco, they are lighted with a gas torch, six at a time, and the operator by turning a valve on and off simulates a man puffing. The pipes are smoked five times, for about 10 minutes each time, to break in each pipe at a slow, proper speed. The smoke from this operation rises into a hood and is carried to the dust collector.

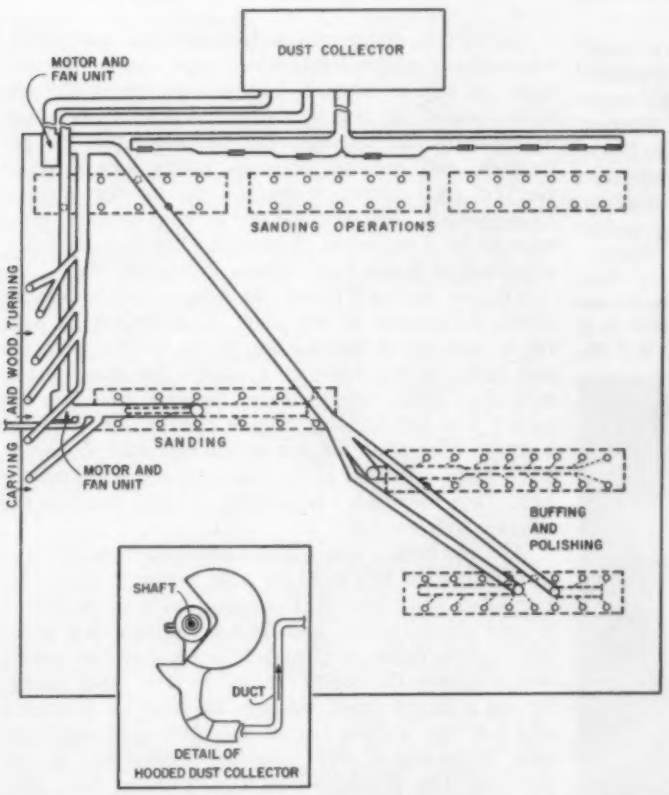
The collector is located behind the main plant. Three duct lines lead from the plant to the collector. A 14-in. duct with a 25-hp fan motor serves the bit, tube and assembly departments in the basement. A 12-in. duct with a 20-hp fan motor serves the sanding department on the first floor. A 10-in. duct with a 10-hp fan motor serves the packaging and shipping department.

Waste consists of lint, buffing wax, sanding dust and shavings. Heavy pieces of waste, broken shanks, chunks of briar, etc., as they enter the dust collector, are dropped to the bottom of the hopper. The fine dust rises through cotton tubes and is retained on the inside of the tubes as the air filters through the cloth. The clean air, in winter, is then returned to the plant. **End**

Pipes are pre-smoked to "break" them in. Smoke is ventilated to the collector.



Above: Ducts, foreground, carry air from plant to collector. Square ducts are the return system. They are used primarily in the winter months for reclaiming the plant's cleaned, heated air.



Over-all view of ductwork of central dust collector system. Previous venting arrangement created vacuum problems. However, this situation has been corrected with use of present system.

National Biscuit's plant at Fair Lawn, N. J. is a steel-framed structure with masonry walls both inside and out.

SANITATION AND STRUCTURAL DESIGN— THEY GO HAND-IN-HAND AT NABISCO

INSTITUTING AN effective and economical sanitation program in a new food processing plant must begin with a study of the proposed building's structural design.

Any part of the design that complicates the program, or adds unnecessarily to the over-all cleaning costs, must be scrutinized closely for a more realistic approach to the problem.

Sometimes it is just a matter of using improved structural materials, a practice long followed by National Biscuit Company and one carried out when the company erected its Fair Lawn, New Jersey, plant. Having followed an intensive sanitation program since 1945, National Biscuit, through its Department of Engineering, has solved many troublesome building construction problems—problems that could, conceivably, create higher construction costs, as well as difficult cleaning and sanitation conditions.

Easy cleaning features of glazed tile make sanitation efforts easy in areas like this washroom. All that is needed is a simple wiping and mopping operation and the job is done.

One of these problems is that of water seepage through the walls during rain storms. Unless the fault is permanently corrected, or not permitted to exist in the original design, interior repairs and repainting are a yearly maintenance burden on the sanitation department.

The culprits that permit such seepage are, quite often, conventional mortar joints which form continuous passages for rain to enter. Nabisco's Engineering Department decided the best way to avoid this situation was to minimize this seepage, trap the water that did get through, and provide drainage points which would carry it away before it reached the interior surface. Consequently, they specified that exterior masonry walls were to be constructed of Modular Dri-Speedwall tile, a product of Natco Corporation, Pittsburgh, Pa.

Exterior unglazed facing tile forms a trap to prevent continued passage of the water. Construction of each tile is such that it forms a gap in the mortar joint, the gap being in the form of a gutter. Incoming water, instead of being able to bridge the gap, falls into the gutter. The self-draining feature permits the collected water to drop from tile row to tile row until it reaches weep holes provided at window cappings and foundation. Thus there is no possibility of water reaching the interior wall surface.

A bonus benefit that Nabisco obtained from this type of construction was a 30 per cent saving in wall erection labor and material: Each tile unit is equivalent to 6 conventional bricks, and the natural hand grip in the shape of the drain gutter makes the tile easier to handle, which speeds the laying operation. The inner facing, having a glazed finish, obviates the need for plastering and painting, and the smooth surface is practically dust and maintenance free. General contractor on the job was The Walter Kidde Constructors, Inc., New York. **End**

SELECTING BEST SYSTEM VOLTAGE

By R. L. NAILEN, Westinghouse Electric Corporation, Sunnyvale, California

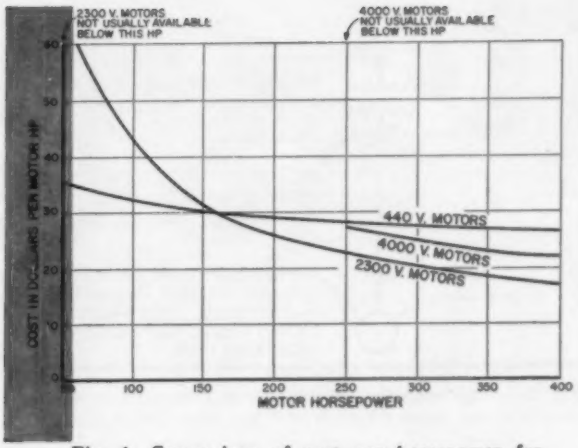


Fig. 1. Comparison of cost per horsepower for 440-v, 2300-v and 4000-v, 1800 rpm open motors.

PRESENT practice in electrical system design is to set the nominal system voltage somewhat above the rated nameplate voltage of connected load equipment. High load concentration, with high current demand, causes actual voltage at the load to drop below this nominal value. This is the basis, for example, for using a nominal 480 volt system to supply motors rated 440 volts. Commonly used voltages for systems and motors are shown in the table.

Which of these standard system voltages may be chosen to supply a particular plant area depends upon many factors such as load magnitude, distances from distribution center to individual loads, and safety to personnel. Where motors are involved, an important factor is the cost of motor and control as a function of rated motor voltage. Motors of low voltage will draw such high currents above about 200 hp that the cost of control and conduit runs becomes prohibitive. To economize, 2300-volt motors are preferable. However, below about 50 hp, the extra cost of providing insulation and creepage distances for the higher voltage again results in high motor and control prices. So for each common distribution voltage there is a range of motor sizes within which that voltage is the most economical. The curves of Fig. 1 show this in a general way for 1800-rpm open motors.

It should be remembered that these cost relationships depend upon physical size of the motor, rather than upon horsepower alone. Motor speed and enclosure, as well as horsepower, affect the size. As has been implied above, there is also an effect of voltage upon size. When selecting system voltage, and especially when modernizing an existing plant, remember that a 2300-volt motor will not necessarily be the same frame size as a 440- or 550-volt motor of the same horsepower rating, speed, and enclosure. Likewise, a 4160-volt motor often will be larger than the otherwise equivalent 2300-volt design. Again, this results from increased insulation and creepage requirements of the higher voltages.

Once the system is in operation, there will be further important effects. The first is voltage drop. The flow of motor load current through transformers, cable runs, bus duct, and the like, cause an impedance drop in each. These all add up. The net effect is a reduction in available voltage at the motor terminals, as compared to the nominal system voltage at no load.

This is particularly critical during the motor starting period when the motor will draw 600 to 800 per cent of its rated full load amperes. In the first place, the drop may be severe enough to cause other system loads to operate improperly or to break down. Secondly, the reduction in voltage at the motor will cause motor torque to drop in direct proportion to the square of the voltage decrease. In extreme cases, the motor may therefore be unable to start its load at all, or may overheat while accelerating.

As an example, consider Fig. 2, which shows the effect of starting voltage drop on a typical installation. Supposing this motor to have a starting torque of 125 per cent at full voltage, then it would seem reasonable to apply it to a load requiring 100 per cent rated torque on start. But note that the actual drop in motor voltage causes motor starting torque to drop to 87.5 per cent. Since that is not enough to start the load, this application is in for trouble.

Reduced voltage while the motor is running causes another problem. Lowered voltage means higher than normal current to supply the same horsepower load. This, in turn, means overheating in the windings and reduced insulation life. For example, a 12 per cent voltage reduction at the motor terminals can halve the expected life of the insulation. Of course, while such a voltage is not uncommon it is generally encountered only a small percentage of the time that the motor is operating.

Still another effect of voltage variation is change in motor speed. Motor slip or the difference between synchronous speed and actual running speed under load, varies inversely as the square of the applied voltage. Lowered voltage thus means lowered speed. Some loads, such as centrifugal pumps, have power requirements which vary as the cube of the speed. Drop in motor speed may then cause the horsepower demand on the motor to drop sharply, as will the useful work done by the load.

Most of the above difficulties are caused by motor voltage that is too low. However, many systems are

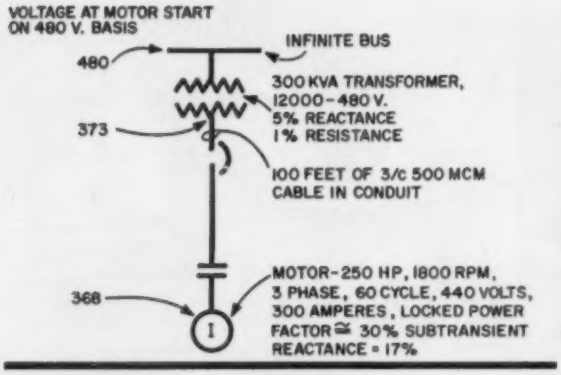


Fig. 2. In this example, system voltage drop reduces motor torque to the point where it will not start the load at all.

operated such that changes in overall system load can result in excessively high motor voltages. This is commonly caused by the use of high tap changer settings on distribution transformers, used to attempt to compensate for excessive drop when all connected loads are in use. Removal of several loads can then raise the voltage too high. Motor performance may again drop off, due to magnetic saturation in the core laminations. Excessive torque due to high voltage may overstress shafts and couplings when starting loads.

Although good distribution system design is effective in alleviating the problem of voltage spread, it is inherent in any system and will always be present to some extent, even when such means as voltage regulators are used to offset it. Thus, to take this spread into account and to make it possible for users to apply motors intelligently, the motor industry has standardized the voltage spread that motors will accommodate.

This is expressed in NEMA Standard MG1-2.02, which states that induction motors "shall operate successfully at rated load with a variation in voltage" up to "plus or minus 10 per cent." The standard states further that "Performance within these voltage variations will not necessarily be in accordance with the standards established for operation at rated voltage."

Unfortunately, the meaning of "successful operation" as expressed in the NEMA Standard is often misunderstood. In particular, it does not imply that the motor will have NEMA Standard torques or starting current for such voltage variation. It means only that the motor will continue to drive its rated horsepower load without overheating.

This misunderstanding crops up most often in applying standard volt motors on 208-volt systems. The vast majority of general purpose industrial motors are rated 220/440 volts because of the universal use of distribution voltage of 240 or 480. But with increasing popularity of the 208-volt network distribution system, there is now a user demand for 220/440-volt motors with nameplates stating that they may be operated at 208 volts. Many standard motors are automatically supplied with such nameplates. Users often ask if such stamping is feasible on motors which do not already carry it.

This practice likewise is recognized by NEMA. Standard MG1-4.21 reads as follows: "General—A 220-volt induction motor, when operated with 208 volts at the motor terminals, will deliver approximately 11 per cent less locked-rotor and breakdown torques and draw from 0 to 4 per cent more line current at rated load as compared to operation with exactly 220 volts at the terminals."

"A. Network systems normally have less voltage variation than radial systems and are commonly held to about a minus 5 per cent variation for the radial systems. Hence, a 220-volt motor which delivers sufficient locked-rotor and breakdown torques for successful operation on the minimum voltage of a 220-volt radial system will have essentially equal torque on the minimum voltage of a 208-volt network system. Therefore, 220-volt induction motors can be and often are used on a 208-volt network system."

"B. For induction motors rated 208-220 volts or 208-220/440 volts, regardless of the distribution system, the voltage range for successful operation of the motor is plus or minus 10 per cent of the 220-volt or 440-volt rating."

This too is frequently misunderstood. The first thing to remember here is that a 208-220/440-volt motor is not intended to carry its rated horsepower load at 10 per cent below 208 volts. It remains a 220/440 design, and will operate satisfactorily for voltages no lower than 5 per cent below 208. If a 208-volt system is to be used, and voltage is not to be limited to 208 plus or minus 10 per cent. While readily available, such designs are not usually off-the-shelf items. And such a motor might be in trouble if used later on a 240-volt system as 240 volts is 15 per cent above 208.

The second thing to remember about such applications is that NEMA torque guarantees will not necessarily be met even at 5 per cent below 208 volts. If the voltage on start falls that low, a 208-220/440-volt motor may fail to start a load of high inertia or high accelerating torque.

Again, 208-volt system operation of a standard 220/440-volt motor may be "successful" in that the motor may carry its rated horsepower safely. But if starting duty is severe, or if the application depends closely upon normal performance guarantees, there may be trouble. As mentioned above, drop in full load speed at the reduced voltage can be a problem.

From the foregoing, it should be evident that it is not a safe general practice to "restamp" a 220/440-volt motor with 208-volt ratings. Such a revised nameplate, which no longer shows any reference to the voltage for which the motor was designed, can easily lead a user astray in applying the machine. **End**

Table of standard electrical distribution system voltages and corresponding standard motor and control rated voltages.

Nominal System Voltage	Transformer Secondary Voltage	Motor and Control Rated Voltage
120/208	120/208	220 or 208
240	240	220
480	480	440
600	600	550
2400	2400	2300
4160	4160	4000
6900	6900	6600

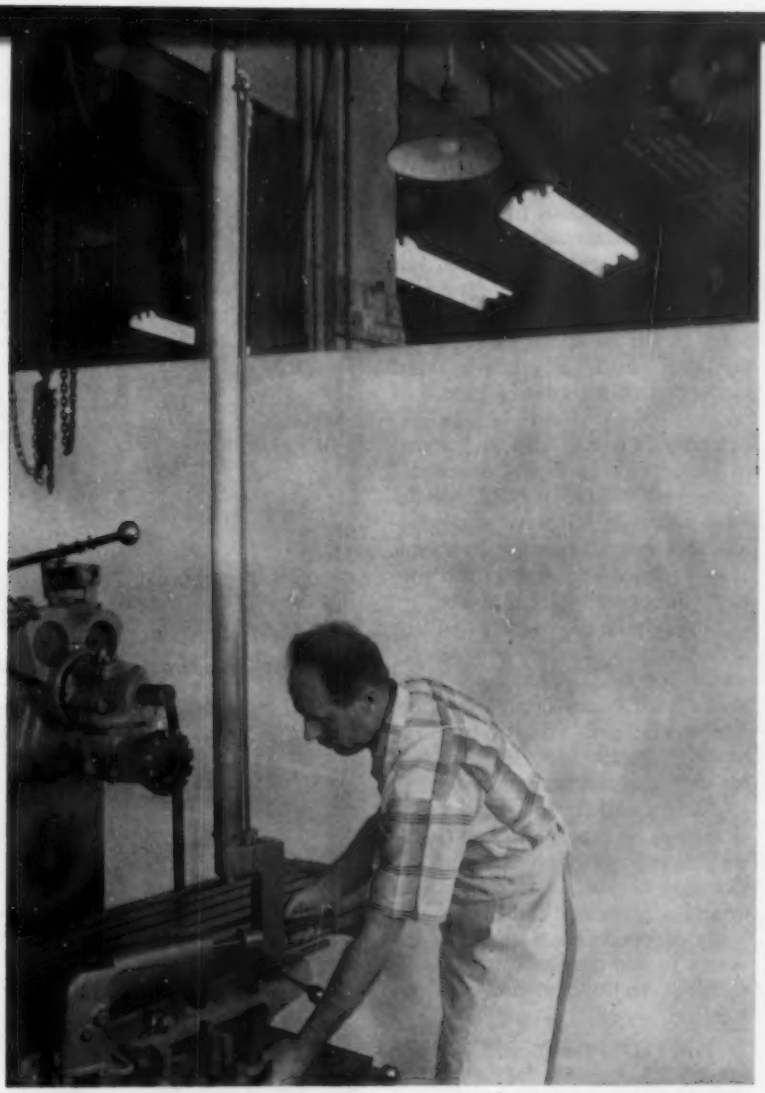


Fig. 1. The movement of the control handle in an upward or downward direction from the neutral position, channels air to raise or lower an object.

MECHANICAL HANDS HELP WORKERS

By WM. R. PARKER, Union Special Machine Company, Chicago, Illinois

HANDLING of sewing machine bed castings was a problem at Huntley, Illinois plant of the Union Special Machine Company. The cast iron bed casting is the heaviest single part of the sewing machine and contains the majority of the mechanism necessary to the functioning of a sewing machine. A multitude of machining operations are needed to allow for the proper positioning of the various parts within the limited space of the bed casting.

Four-wheeled hand trucks having three shelves of a compartmented nature are used to transport the bed castings through the plant from one manufacturing operation to another. The bed casting is lifted from the hand truck and placed into the appropriate fixture for a machining operation.

After the bed casting has been machined the casting is again lifted from the fixture and returned to the shelf of the hand truck for storage until the next machining operation is performed. As a result every casting is handled at least twice for every individual machining operation.

The majority of machining operations are of a short machine cycle time which means that the castings are lifted in and out of the machine fixtures at the rate of about 150 times per hour. Since the average bed casting weighs between 40 and 50 lb each, it does not take long before several thousand pounds of metal per hour are handled. Under such conditions the operator rapidly becomes fatigued and long before the end of the work day the production rate slows down considerably.

Since purchaseable equipment could not be found that was completely suitable, our engineering department undertook the task of developing a mechanical means of aiding the human muscle power needed to perform our machining operations. After nearly a year and

a half of designing and testing, our Servo Lift was perfected incorporating the following features:

To keep the actual time involved in vertical movement to a minimum, all speeds from 0 to 400 fpm are instantly available by merely grasping a single control handle in the palm of the hand. In order to lift the work load, a gentle upward movement of the control handle of no more than ⅛ in. is required. Similarly, a work load is lowered by exacting a slight downward movement on the control handle. The handle is returned automatically to a neutral position by means of two equalizing springs the moment the operator lets go of it.

Through the use of the equalizing springs the Servo Lift can quickly and easily be adjusted to lift and hold a load in any desired position. The operator is able to lift in a normal manner with his elbow at his side and his forearm extended.

The Servo Lift was designed to eliminate all excess bulk and dead weight thus providing a lifting device that can be set readily in motion in a horizontal direction and is easily stopped. Parts that are exposed to air line moisture are of stainless steel and of non-corrosive material.

A straight hook is provided for the simple spearing type of applications. This hook is quickly removed by simply loosening two set screws that secure the hook in place. Any self-styled grapple or hooking device so designed to suit individual needs may be easily inserted into the ⅝ diameter socket locked in place by tightening the two set screws.

The lifting equipment can be suspended from any trolley mounted on a fixed running rail or a swinging jib crane. In a fully retracted position it has an over-all length of 11½ ft. Models are available in shorter or longer lengths to accommodate various ceiling heights. A wide variety of installations can be readily fabricated from standard hardware items.

It has been clearly shown that the Servo Lift has directly eliminated the bulk of the human muscle power required and substantially reduced the fatigue rate involved in the machining operations at the Huntley plant. **End**

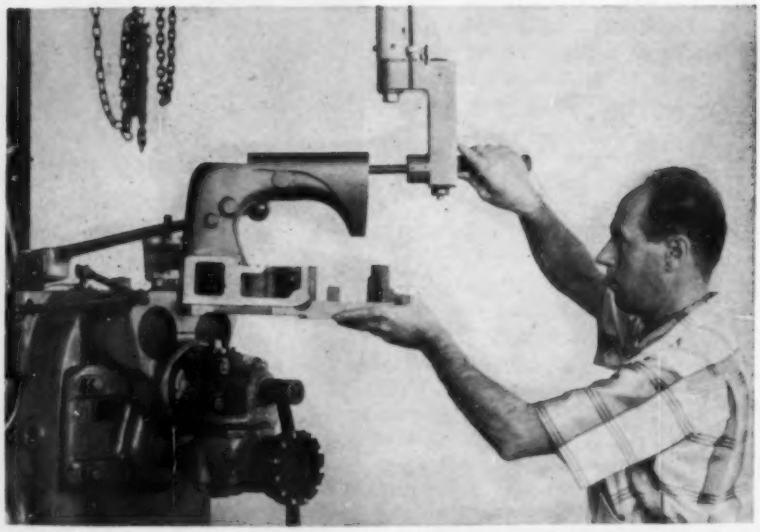
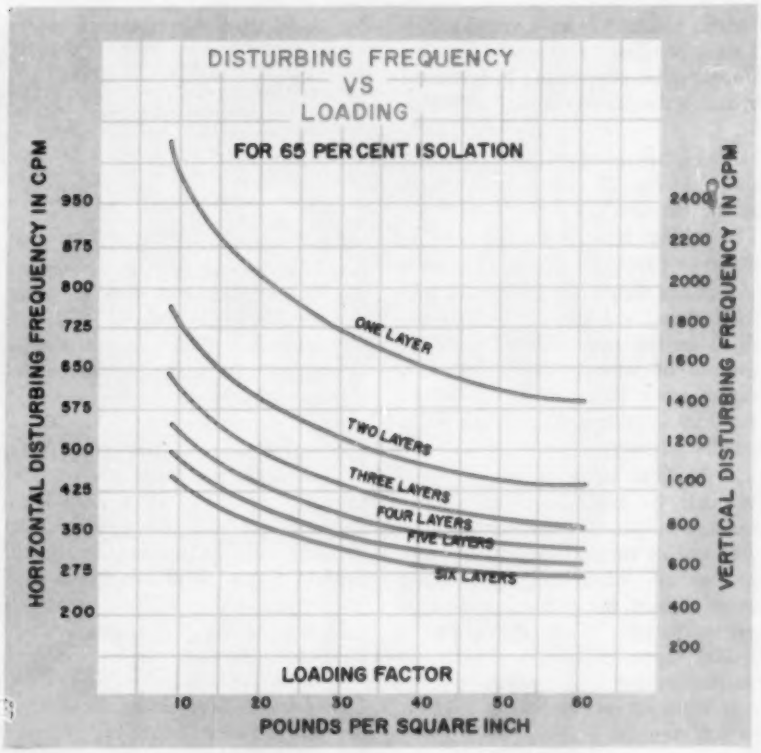


Fig. 2. Bar extending from valve is used for lifting of sewing machine castings.

Fig. 3. Hook instead of lifting bar is put to work on casting in another plant.

Fig. 4. Handling of tractor attachment at the plant of a garden equipment firm.

Fig. 1. Disturbing frequencies versus loading curve. Number of layers of pads required to provide 65 per cent isolation may be determined from it.



VIBRATION ISOLATION PADS

How to select them
How to calculate what you need

By PAUL NISSEN, Engineer, Isomode Div., M B Electronics, Div. Textron Electronics, Inc.

MORE THAN EVER before, plant engineers and superintendents are under pressure from cost-conscious management to slash maintenance requirements as much as possible. This is easily understandable in light of constantly mounting material and labor costs, and the limits to mechanization of maintenance work. One area for reduction of indirect costs is in the handling of machine vibration.

Traditionally, vibration is handled by setting a piece of equipment on a concrete foundation and bolting it down. However, a far more effective means of handling this problem is to use vibration isolating materials instead of bolting.

Rubber pad mounts, for example, offer many advantages over bolting. They are simple to install since they avoid the need for floor preparation, locating and drilling holes, etc. Equally important, they provide flexibility in equipment layout that is of particular importance in this day of rapidly changing techniques and processes. Re-location of equipment is quick and easy because it is not tied down by bolts either at the old or the new location. The time and labor cost that can be run up if equipment is moved a number of times can be formidable. These pads can cut the time and cost by at least 50 per cent, sometimes more.

Sound deadening is another advantage of this type of mount over bolting. Reducing background machine noise results in better working conditions for operating personnel and consequently increased efficiency.

Rubber vibration-isolating pads usually are molded of DuPont Neoprene, according to specifications established by ASTM (#D395-55 Method B). This material provides excellent resistance to industrial greases, oils, and other commonly encountered chemicals. Standard durometers range from 45 to 65 shore hardness. The 65 durometer product has a spring rate approximately three times as stiff as the 45 durometer. However, 45 durometer material has more general application and will be used as the subject of discussion here.

The co-efficient of friction of this type of pad is approximately 1.0. A crossribbed design pad makes it an efficient energy absorbing device, and therefore horizontal forces several times the weight of the machine can be generated without slippage. When the machine weight is applied at the rate of 50 psi the machine is imbedded in the pad. See Fig. 1. In the case of machinery, the pad should extend approximately ¼ in. for ease in installation.

When the subject to be isolated is light in weight, or has a high center of gravity, bolting may be required. This allows compression forces across the pad in excess of those attainable from weight of the machine. If the subject develops high vertical or horizontal forces, it may require bolting if an inertia or seismic block is not practicable

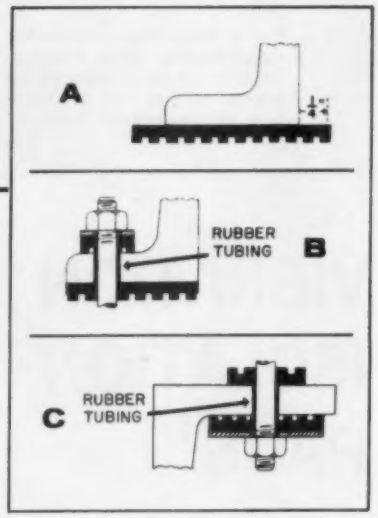
(inertia blocks will be covered later). This is handled as shown in Fig. 2b. Hanger-type supporting is achieved in much the same manner. See Fig. 2c.

The purpose of the rubber tubing shown in Fig. 2b and 2c is the same as the insulation on electrical wire. The subject is not touching the tie-down or support bolts at any point.

Natural frequency of the pad and its isolated equipment can be defined as the number of cycles per minute of vertical oscillation that occur when the machine is moved from its equilibrium and allowed to oscillate freely.

Vibration isolation is obtained basically by maintaining proper frequency relations between the subject and its support mount. In order to isolate vibration, the subject must deflect the pad by means of gross weight. This deflection is called static deflection. Maximum recommended static deflection of one layer of rubber pad is 1/16 in. which can be realized by a 50-lb loading.

Fig. 2. (a) Pad should extend ¼ in. around machinery for ease of installation; (b) bolting may be required if high vertical or horizontal forces develop; (c) hanger-type support is achieved in similar manner. Rubber tubing in 2b and 2c prevents subject touching the tie-down or support bolts.



Most machinery such as that found in the average machine shop can be isolated with one layer of pad. A 50 psi loading is generally recommended. Pads are cut to size so that each 50 lb of machine weight is supported by a square inch of rubber. An extension of ¼ in. is allowed beyond the supporting plate or foot of the unbolted machine, as shown in Fig. 2a. The total area required for the machine weight should be divided among the legs or support points in proportion to the weight at each point. To check, the thickness of the pad under load is measured. A properly loaded pad should be ¼ in. thick.

The standard recommendation for the isolation of punch presses or equipment that operates like a punch press, such as shears and press brakes, is to load the pad at the rate of 25 psi. In general, a single thickness of pad is adeqate for presses up to 100-ton capacity, and two layers of pad for presses over 100-ton capacity.

The following examples will show how the pad size should be calculated.

On a 600-lb grinder with weight uniformly distributed, each of four legs supports 150 lb. At a normal loading of 25 psi, six square inches of 45 durometer pad, or a 3-in. by 2-in. pad is required under each leg.

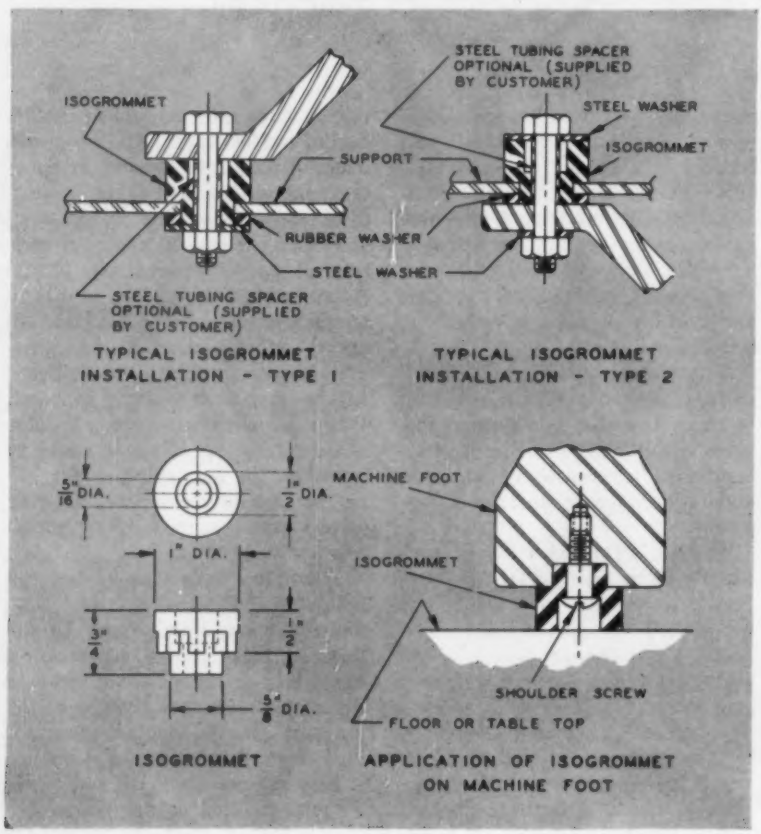
When the supports of a machine are not equally loaded, the size of the pad should be adjusted so that equal deflections are obtained at each support. A tilt-back punch press with four legs, normally heavier at the rear, illustrates such a condition.

Assuming a total weight of 13,000 lb, the front leg load might be 5000 lb; the rear leg load 8000 lb. Pad required under the rear legs would be 8000 divided by 25, which equals 320 sq in. of pad. Thus, a pad 16 in. by 10 in. would be used at each rear leg. Required under the front legs, 5000 lb divided by 25, which equals 200 sq in. of pad. A pad 10 in. by 10 in. would be used under each front leg.

There are many types of equipment or machinery other than machine shop equipment that creates damaging or undesirable vibration and noise. Most of this equipment falls into the classification of low speed operation vibration, i.e.,

(Continued on page 264)

Fig. 3. Different methods for mounting any light weight equipment on isolators.



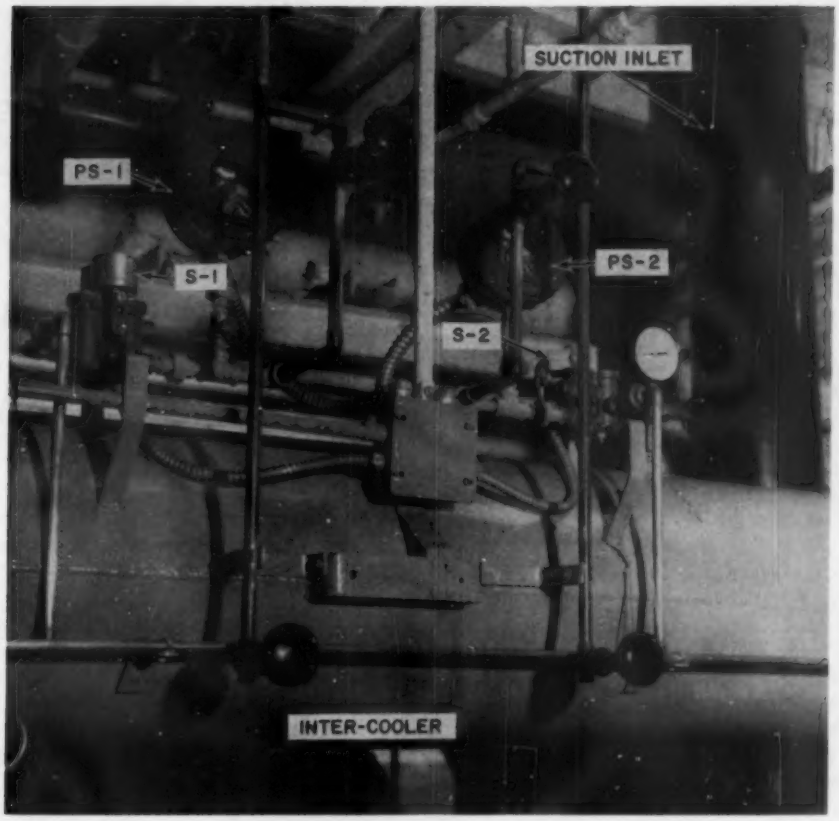


Fig. 1. Three-way solenoid operated valves S-1 and S-2 are bracket mounted.

Dividends from Electrical Hookup in . . . AIR COMPRESSOR UNLOADING

By WALTER JACOBY, Maintenance Supt., Special Products Div., I-T-E Circuit Breaker Co., Philadelphia, Pa.

NUISANCE DUTY, such as manually unloading an air compressor before starting and stopping is neatly overcome by the installation of three-way solenoid valves. The compressor which is affected is a two-stage, synchronous motor-driven, horizontal reciprocating type machine.

The valve tubing which carries control air to the valves is cross-connected, for in this two-stage machine the pistons travel 90 deg apart. Correct timing contributes to load equalization and compression at low speed, as compressed air travels from the low pressure cylinder through the inter-cooler to the inlet of the high pressure cylinder.

The compressor originally was controlled by pneumatic pilot valves. The valves lifted the inlet valves on the cylinders and allowed the air in the cylinder to pass in and out rather than be compressed.

Three-step control was provided by inlet valve unloaders placed behind each inlet valve of both cylinders; these depended on the two pilot valves with preset pressures. With one pilot valve set slightly higher than the other, the unloaders operated independently of one another. When the pressure rose to the setting of one valve, it unloaded. When the pressure of the second valve setting was reached, it unloaded. In unloading, opposite ends of the low and high pressure cylinders were unloaded. The wing nut at the bottom of the pilot valve was used to unload the compressor when starting or stopping.

In twelve months, the daily time required to walk from the compressor to the switchboard after unloading, then back to the compressor to wind the wing nuts to load position added up to very nearly three hours. Repair and adjustment of mechanical pilot valves was always a sore

spot, for they are really annoying when in need of attention, and beyond a doubt can be touchy when adjusting.

The inlet valve and pilot repairs were more pronounced on one set than on the other, for as previously described, one set could do most of the work, operating at different cut-off points, when the compressor is running at light load.

Valve Duty Division

The solution to these disadvantages was not only to replace manual unloading and loading operations by electrical control, but to further provide means of dividing valve duty when operating at 50 per cent capacity.

To accomplish three-step control of this machine electrically, meant providing automatic field application, the idea being to limit start-stop requirements to pushing a button. Automatic equipment was installed which overcame the constant menace of incorrect field application to the synchronous drive motor.

Pipe size from the receiver to the unloading valves is important. Correct pipe sizing, large enough to absorb the shock of loading and unloading, eliminates erratic pressure switch operation, and contributes to smooth operation which is the result of true line pressure at the receiver.

Undersize piping would cause

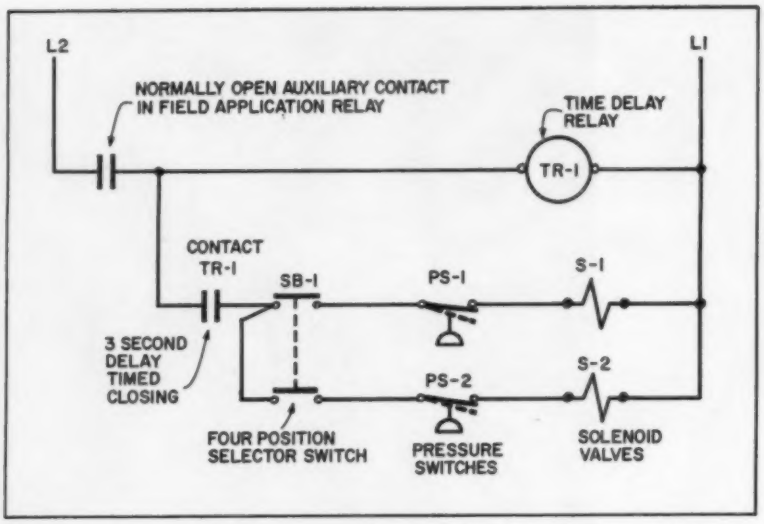


Fig. 2. Schematic electrical diagram shows the tie-in of switches and solenoids.

S-1 and S-2, which are spring loaded to fail in an unloaded position, to machine-gun. Pilot valves would cause the air supply to "bump" the pressure switches, energizing and de-energizing the solenoids in rapid succession.

With cooling water turned on, depressing a pushbutton energizes the motor starter and the motor starts. S-1 and S-2 are de-energized through a normally open contact on the field application relay, placing the pilot valves in an unloaded position, even though P.S.-1 and P.S.-2 are calling for air. Assuming the percentage control selector switch to be positioned for 100 per cent capacity, closing the field contactor closes the auxiliary contact to the time delay relay, TR-1. See Fig. 2. After three seconds, TR-1 contact closes and energizes S-1 and S-2, to load the compressor after it reaches full speed. Operating the pilot solenoids through the time delay relay after field application insures the application of load at full speed.

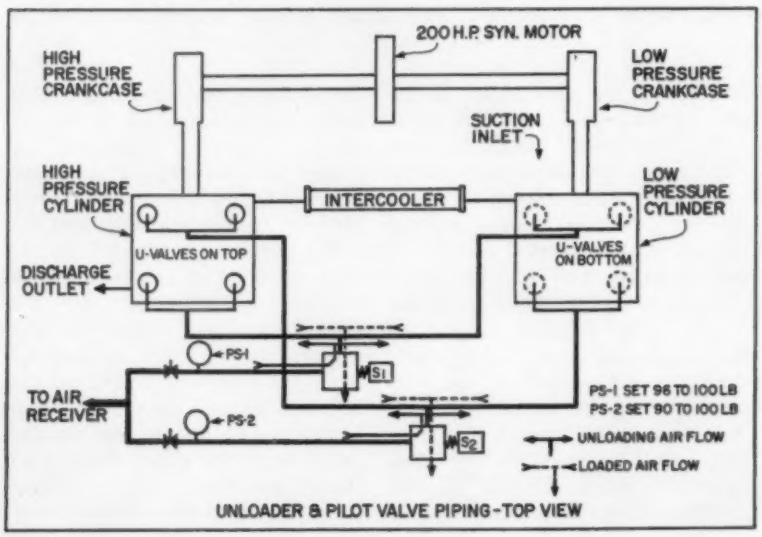
Air passage is closed from the unloading valves to atmosphere. As the pressure drops from 100 lb to 96 lb, P.S.-1 closes electrically and loads the compressor. Pilot air then flows from the valves to atmosphere. When pressure builds to 100 lb, P.S.-1 opens S-1 to unload cylinder inlets, connecting receiver to unloading valves. See Fig. 3.

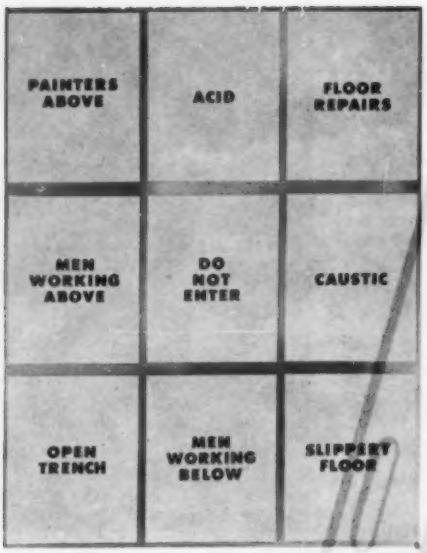
If load exceeds the ability of the compressor to recover at 96 lb, and the pressure continues to drop, P.S.-2 will cut in at 90 lb. At 100 lb, both P.S.-1 and P.S.-2 will unload and hold the inlet valves open to atmosphere.

Half capacity can be selected through a four-position selector switch, to complete the circuit to either S-1 or S-2. With either S-1 or S-2 operating, 50 per cent capacity is obtained. The desirable feature here is that in actual operation, the compressor is operated at 50 per cent capacity on S-1 for four hours, then at 50 per cent on S-2 for four hours. This accounts for the four-position switch on three-

(Continued on page 266)

Fig. 3. High and low pressure cylinders are connected with each solenoid valve.





These are nine standard signs available for warning notices at Visking Corp. plant.

When it is necessary to seal off an area, polyethylene ropes are hung between signs.

For ease in carrying, handholes are provided on each side of sign and parts are hinged.

YELLOW "SANDWICHES" WARN UNWARY

By K. N. BANTHIN, Superintendent, Maintenance and Construction, Visking Corp., Chicago

SHOP-FABRICATED, "sandwich-board" type, portable danger signs with changeable message inserts warn maintenance, production, and office personnel at the Chicago Plant of Visking Company, Division of Union Carbide Corp., of dangerous or unusual conditions.

These signs are 36 in. high and 18 in. wide. They are constructed of ¼-in. plywood and equipped with handholes for easy carrying.

Signs are painted bright safety yellow, and the word DANGER is in white letters on a fire-red background.

The removable inserts are printed in black on heavy white paper stock and then lacquered or heat-sealed in plastic to keep them in bright, legible condition.

A group of nine message inserts are readily changeable and always available with each sign.

When it is necessary to restrict passage in a given area, polyethylene plastic yellow and black safety ropes may be tied into the holes provided near the top edges of each sign.

Safety is one of the most important functions of each plant engineer's job. Eye appealing, clean, sharp signs are one of the effective tools to advertise the safety message. **End**

PREFORMED SECTIONAL FLOORING MATERIAL—

It is easy to install
Takes heavy loads
Can be placed over old floor

Sheets are easy to install and can be laid over concrete, wood or metal.

ARE THE FLOORS in your plant creating an underfoot headache? If so, you will be interested in this easy way to lay down a new floor—right over the old one.

The flooring material, Nu-Flor, comes in ready-made sheets. It requires no mixing, shoveling, tamping or rolling. All you do is set the standard black sheet, 2 ft by 3 ft by ¼ in. thick, over the old floor—be it concrete, wood or metal.

Laid side-by-side, the manufacturer states that these sheets will form a solid "new floor" which is hard and durable and will withstand heavy loads and is ideal for hand or power trucking.

The sheets are constructed of two layers of top quality asphalt-treated felt. These are impregnated with and have a core of scientifically-blended asphalts and interwoven fibers. They also contain the same mineral reinforcing fillers used in composition floors.

What are the application requirements? Here's all you have to do: You need only clean the old concrete, wood or steel floor and make sure it is reasonably level. Then, apply a coating of adhesive (furnished with the sheets) with a notched trowel. Set the squares firmly in place and let the traffic roll! That is all there is to installing this material and your new floor is all ready to be used.

Industrial Applications

In an industrial application at The Alling & Cory Company, Syracuse, N. Y., this flooring has been installed in several heavy traffic areas. In one of the sections where it was installed the maple flooring was breaking up. After the badly worn boards were replaced, the new flooring material was nailed in position. This section, which is in front of a freight elevator, carries heavy truck traffic.

In one of the aisle areas in the plant, plywood was used as the subflooring before applying this flooring material. The aisle area carried moderate traffic.

In another installation, property belonging to R. L. Polk & Company, Detroit, Michigan, was previously occupied by a baked goods concern. The flooring is of tongue and groove wood over an underlay of cement. This flooring was adequate for bakery traffic because truck loads were not excessively heavy.

However, the new owner soon found the floors splintering and deteriorating rapidly under the heavier loads of paper stock and printing supplies, weighing up to 7000 lb. The loads were constantly moving over the area on steel-wheeled hand trucks and rubber-wheeled motorized trucks.

After a successful trial application of this material, the company has resurfaced several other areas in the plant. **End**

This flooring material was installed near freight elevators—a heavy traffic area—in this plant. It was also placed in aisle areas which carry moderate traffic.

Additional Information

If you would like more information about this flooring material, just write to the Editor, Plant Engineering 308 E. James St., Barrington, Illinois, or indicate "Nu-Flor" on one of the post cards in this issue.

HOW TO DESIGN

PNEUMATIC-HYDRAULIC ACTUATION SYSTEMS

FOURTH IN A SERIES OF ARTICLES

Part IV. Designing a pneumatic system for rapid approach, feed, skip, feed and rapid retraction

SOME OF THE more complicated machine movements required in making a product are often simplified through the use of pneumatic components designed for the job. Keeping function and quality in mind, plant engineers should not specify pneumatic valves solely on the basis of price. True, some inexpensive valves will do a satisfactory job but, on critical applications, use caution in making a selection.

Here are some of the things to consider when specifying and installing pneumatic valves.

1. On high cycling applications it is well to eliminate direct-acting solenoid valves; they can become a source of trouble. The fast snappy movement which is characteristic of the solenoid plunger when it becomes energized produces a hammer-like blow. This tends to pound the plunger to pieces when the solenoid is energized several times in rapid succession. It breaks the rivets holding the plunger together and loosens the wear strips in the solenoid body.

The linkage between the solenoid plunger and the valve takes quite a beating, sometimes causing the linkage to crystallize and break. The constant pounding of the solenoid plunger also has a tendency to loosen the parts of the assembly. In many installations the noise is objectionable.

There is no rule as to the maximum safe operations per minute of the larger direct-acting solenoid valves inasmuch as there are so many designs available. Normally, however, the actuations should be kept under 30 per minute.

2. Where long-holding periods are required it is not desirable to use direct-acting solenoid valves of the larger sizes if the current must be held on during the period. Long-holding periods often cause the solenoid coils to burn out. If the valve does not allow the plunger to seat correctly the coils will overheat and fail, even though continuous-duty solenoid coils are used.

3. Don't cheat on the size of the valves used in an installation. Too often, in order to keep costs down, valves of insufficient port size are used. A valve should have, at least, the same port size as the cylinder port size to which it is connected. In applications where one valve is serving several cylinders the port size of the valve should be larger.

Small sized valves actuating large bore cylinders will restrict the air flow as it exhausts from the cylinder

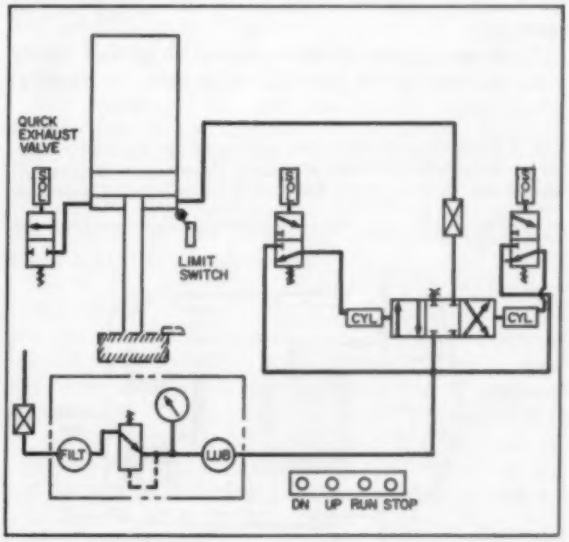


Fig. 1. Addition of the quick-exhaust valve to pneumatic circuit of a drop hammer permits the hammer to drop freely.

and will greatly reduce the cylinder piston speed. A good example of this is on a pneumatically-operated drop hammer, Fig. 1. The three-position valve is large enough to retract the piston. When the hammer drop is desired, however, this valve, plus the restrictions in the piping, puts too much restraint upon the exhausting air.

By adding the quick-exhaust valve the piston will drop freely producing a hammerlike blow. This is a circuit for which you will probably find many uses. Just one word of caution: be sure the components are plenty rugged.

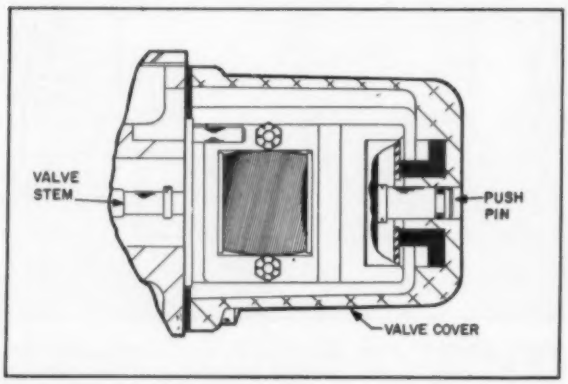
4. While cam-actuated, four-way, two-position, spring-offset valves of the larger sizes often give trouble on high-cycling applications due to spring breakage, they do serve a real purpose in circuits requiring a positive sequence. They are much more adaptable than air-sequence valves—especially if there is a fluctuation in line pressure. These valves will be discussed more thoroughly in a later article but keep them in mind for those extra critical applications.

5. Consider the use of manifold-mounted, four-way control valves. These valves "dress up" a machine because the piping is out of the way where it is not visible. Big advantage is that the valve can be removed from the machine for servicing without disturbing the piping. To remove a manifold-mounted valve it is only necessary to remove three or four screws. Even some of the newer solenoid-operated, manifold-mounted valves have plug in connections for the solenoids.

6. The plant engineer should consider the use of solenoid, pilot-operated, four-way controls with push pins as shown in Fig. 2. These are especially helpful on the more complicated circuits. By manually actuating the push pins one can shift the valve spool without energizing the solenoids. This is advantageous in checking out a circuit or for setup purposes. In operation, if there is a valve malfunction, it is easier to determine the cause or location if the valves are equipped with push pins.

7. In using pilot bleeder-operated, four-way valves keep the lines to the pilot valves as short as possible.

Fig. 2. Four-way controls with push pins are especially helpful in complicated circuits. Manually actuating push pins will enable one to shift valve spool without energizing solenoid.



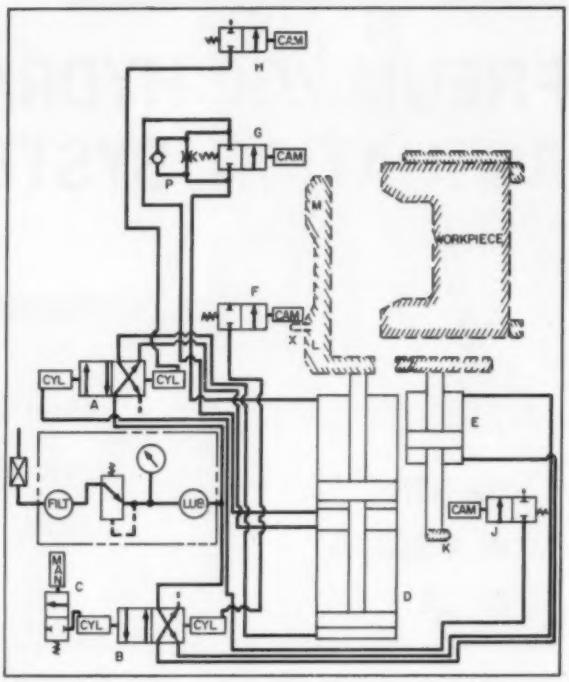


Fig. 3. Most circuits that control complicated movements are combinations of basic circuits; two circuits are shown here.

Any distance over 7 or 8 ft is considered too long for satisfactory actuation. Also, eliminate any restrictions between the four-way valve and the pilot-valve.

If longer lines to the pilot valve are necessary then use a pilot pressure-operated, four-way valve. It will require more piping but will eliminate malfunctions.

8. If you expect to use a three-position, closed-center air valve for accurate positioning you will probably be disappointed. It is very difficult to suddenly stop an air piston movement by centering a valve. The reason being that air is highly compressible. Where accurate positioning is involved use an air-hydraulic cylinder and apply the shutoff to the oil or use a hydraulic system.

9. In designing or installing mechanical actuators for depressing rollers on cam-actuated valves, trips on toggle-actuated valves, and pins on rollers on limit switches special care should be used to make certain that the actuators do not cause the operating mechanisms to overtravel. This often causes breakage and excessive wear. Where actuation is desired in one direction only a swing-type trip or actuator should be employed. This allows the actuator to ride freely over the operating mechanism in one direction.

Actuators should be installed so that they will not loosen under constant usage. It is well if the actuator is made to compensate for wear.

Where a roller is actuated by a cam the slope on the cam should be as shallow as possible in order to reduce side thrust on the operating mechanism. Valve stem packing leakage is often attributed to excessive

side thrust by a cam having a rise that is much too steep.

10. Location of the controls is important. Remember, even the best equipment needs servicing. Mounting the controls on a panel is excellent. Here the maintenance man has easy access and can readily service them.

Keep the controls off the floor so they are not in danger of being bumped by a shop truck or accidently tripped by a passer-by.

Most of the more complicated movements are a combination of basic movements. For example, if we want to hold a workpiece while a tool approaches it rapidly, the tool performs an operation on a portion of the workpiece at a slow feed. The tool then moves rapidly until it approaches the next portion of the workpiece. Then it feeds again to complete the remainder of the stroke. Finally, the tool is returned rapidly to the starting position. It takes only two basic circuits to do this job as shown in Fig. 3.

No electrical controls are employed in this circuit. The operator places workpiece in fixture and momentarily depresses pushbutton of two-way pilot valve C. This causes spool of pilot bleeder-operated valve B to shift and direct air to blind end of clamp cylinder E. Piston of cylinder E moves forward clamping workpiece in fixture.

Just before clamping takes place, swing-type cam K momentarily depresses roller on two-way valve J. This causes spool in valve A to shift and direct air pressure to blind end of tool-feed cylinder D. Piston of cylinder D moves rapidly until cam M depresses roller of two-way shutoff valve G. Piston then goes into feed cycle as oil must pass through variable orifice of valve P.

". . . instruction sheet 14, page 2 . . . instruction sheet 14, page 2 . . . instruc . . ."

When work has been completed on first section of workpiece, roller of valve G rides off cam M. Piston of cylinder D advances rapidly until cam L contacts valve G; then piston again goes into feed. As second section of workpiece is removed cam M contacts roller of two-way pilot valve H. This causes spool of valve A to return to original position and air pressure is directed to front side of air piston in cylinder D.

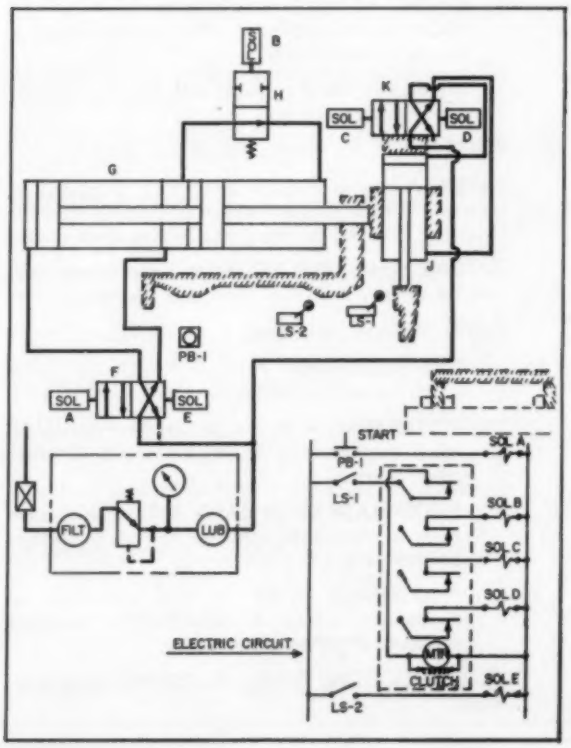
Piston retracts rapidly as oil is free to flow through check of valve P. As piston in D nears retracted position swing-type trip X momentarily trips roller of two-way pilot valve F. This causes spool of valve B to return to original position and direct air pressure to rod end of cylinder E and clamp is opened.

The reason for the selection of the air-hydraulic cylinder for the tool cylinder is that the feed is much more dependable than with an air cylinder and the position at which the feed takes place is more accurate. For certain operations an air cylinder would suffice. An example of this would be a bending operation where a skip feed is desirable.

There are applications where, instead of feeding after the rapid advance, it is desirable to stop the motion momentarily. Such is the case when nailing precut wooden sections, drilling several holes, staking at several spots, or spot-welding an assembly. There are several ways that this problem can be approached but we will use an electrical circuit in which the work is stationary and the head moves. It could be set up so that the head is stationary and the workpiece is moved. It all depends upon the size of the workpiece.

In Fig. 4 the parts to be nailed are placed in the fixture and the operator momentarily depresses electric pushbutton PB-1 which energizes solenoid A of four-

Fig. 4. This automatic nailer circuit stops the motion momentarily instead of feeding after the rapid approach of the head.



way, two-position valve F. Air pressure is directed to blind end of air-hydraulic cylinder G and piston of this cylinder advances until roller of LS-1 is depressed by swing-type cam on piston rod. When roller of LS-1 is depressed timer is energized and timer motor starts. Contactor causes solenoid B to be energized and this stops oil flow through two-way, two-position, normally-open valve H. This immediately stops piston movement of cylinder G even though air pressure is still applied to the blind end.

The next contactor causes solenoid C of valve K to become energized. Piston of valve K is shifted directing air pressure to blind end of nailing cylinder J and nailing head is rapidly advanced. When nail is driven into workpiece contactor releases solenoid C. Next contactor causes solenoid D to be energized, piston of valve K is shifted to original position and air pressure is directed to rod end of cylinder J. Piston and nailer head rapidly retract.

Contactor which is causing solenoid B to be energized is released and valve H is opened. Timer resets. Piston of cylinder G advances until second trip contacts LS-1. Piston of G is immediately stopped and nailing head cylinder repeats its cycle. The same sequence will take place as each trip contacts LS-1. As piston of G reaches the end of its stroke, the trip will contact roller of LS-2. This causes solenoid E of valve F to be energized and spool of E is shifted directing air to the rod end of the air section of cylinder G.

Piston quickly returns as ball checks in oil piston open. As swing type trips ride over roller of LS-1 nothing happens as the trips do not depress the roller.

FLUID POWER TERMS AND DEFINITIONS A PLANT ENGINEER

There are many terms that are used and misused in regard to fluid power components and their application to a system. The Terminology Committee of the National Fluid Power Association has developed a set of Approved Definitions for Fluid Power Terms. A partial list of these terms and definitions, important to plant engineering personnel is as follows:

ACCUMULATOR: A storage chamber in which fluid energy may be accumulated and withdrawn.

ADDITIVE: A chemical compound or compounds added to a fluid to change its properties.

AFTERCOOLER, WATER COOLANT: An aftercooler which utilizes water as the cooling medium.

COMBINATION DIAGRAM: A drawing utilizing a combination of graphical, cutaway, and pictorial symbols showing interconnecting lines.

CONTROL: A device used to regulate the function of a component or system.

- **AUTOMATIC:** A control which actuates equipment in a predetermined manner.
- **CYLINDER:** A control in which a fluid cylinder is the actuating force.
- **ELECTRIC:** A control actuated electrically.
- **HYDRAULIC:** A control actuated by a liquid.
- **MANUAL:** A control actuated by the operator.
- **PNEUMATIC:** A control actuated by air or other gas pressure.
- **PRESSURE COMPENSATED:** A control in which a pressure signal operates a compensating device.

CYLINDER: A device for converting fluid energy into linear motion. It usually consists of a movable element such as a piston and piston rod, plunger or ram operating within a cylindrical bore.

- **DOUBLE ACTING:** A cylinder in which fluid force can be applied to the movable element in either direction.
- **DOUBLE ROD:** A cylinder with two piston rods, one extending from each end.
- **PISTON TYPE:** A cylinder in which the movable element has a greater cross-sectional area than the piston rod.
- **PLUNGER TYPE:** A cylinder in which the movable element has the same cross-sectional area as the piston rod.
- **SINGLE ACTING:** A cylinder in which the fluid force can be applied to the movable element in one direction only.
- **SINGLE ROD:** A cylinder with a piston rod extending from one end.

ELASTOMER: An elastic, rubber-like material.

FILTER: A device through which fluid is passed to separate it from matter held in suspension. A filter is usually installed on the pressure side of a pump.

FITTING, REUSABLE HOSE: A hose fitting that can be removed from a hose and be reused.

FLUID: A liquid or a gas.

- **FIRE RESISTANT:** A fluid difficult to ignite which shows little tendency to propagate flame.
- **PETROLEUM:** A fluid composed of petroleum oil. It may contain additive amounts of other constituents.
- **PHOSPHATE ESTER BASE:** A fluid which contains a phosphate ester as one of the major components.
- **PHOSPHATE ESTER:** A fluid composed of phosphate esters. It may contain additive amounts of other constituents.

FLUID FRICTION: Friction due to the viscosity of fluids.

To design the above circuit using all pneumatic actuators such as two and three-way pilot valves would be quite complicated unless a timer arrangement, working from a motor driven driveshaft were used, and this would be quite expensive and bulky.

Electrical Controls Work, Too

This application lends itself very readily to electric-operated controls. The solenoid operated valve K is small and can be an integral part of cylinder J. Solenoid controls provide for an instantaneous reaction whenever a solenoid is energized. The timer eliminates a number of exposed actuators. In this circuit either direct-acting solenoid valves or pilot-operated solenoid valves may be used as the cycle time is not excessive.

Methods other than using a limit switch may be devised to create an electric impulse which sets the timer in operation.

In designing and building a machine with either an air or hydraulic system one should always be aware of possible "pinch points". Pinch points are spots on the machine where it is possible for an operator to get a finger or hand caught when components of the machine are in motion. The operator might be leaning against a machine or he might slip and fall against it.

Even though the machine has a safety circuit someone standing talking to the operator may place his hands in a "pinch point". Most plants are very conscious of this and are definite in their specifications about eliminating such points. Even after machines are built it is often necessary to add extra guards or shields for protection. "Pinch points" are not only dangerous to the operator but also to the machine. If a small part should drop into the machine at a "pinch point" it is liable to cause considerable damage.

In the next article we will consider rapid approach, reciprocate and rapid retraction. **End, Part IV**

MAY BE CALLED UPON TO RECOGNIZE OR USE

FLUID POWER SYSTEM: A system that transmits and controls power through use of a pressurized fluid within an enclosed circuit.

FLUID STABILITY: Tendency of a fluid to resist permanent change in properties.

GRAPHICAL (SCHEMATIC) DIAGRAM: A drawing or drawings showing each piece of apparatus including all interconnecting lines by means of approved (ASA, JIC) standard symbols.

INHIBITOR: Any substance which slows or prevents such chemical reactions as corrosion or oxidation.

INTENSIFIER: A device which increases the working pressure over that of the primary pressure source.

MANIFOLD: A conductor which provides multiple connection ports.

MANUAL OVER-RIDE: A means of manually controlling an automatic device.

METERED FLOW: Flow at a controlled rate.

PLUG, DRYSEAL PIPE: An externally threaded plug made with a thread cut to dryseal pipe standards.

PORT VALVING: A controllable opening between passages; i.e. one which can be closed, opened, or modulated.

PRESSURE: Force per unit area, usually expressed in pounds per square inch (psi).

PUMP: A device for converting mechanical energy into fluid energy.

- **FIXED DISPLACEMENT:** A pump in which the displacement per cycle is constant.
- **VARIABLE DISPLACEMENT:** A pump in which the displacement per cycle can be varied.

SEALING DEVICE: A device which prevents or controls the escape of a fluid or entry of a foreign material.

SHOCK PRESSURE: The excess pressure existing in a pressure wave.

SURGE: A momentary rise of pressure in a circuit.

THREADS, DRYSEAL PIPE: A pipe thread in which the truncations at the root and crest of the internal and external threads are controlled to give an interference fit by deformation in assembly.

VALVE: A device which controls fluid flow conditions such as pressure, temperature, time, or rate.

- **CLOSED CENTER:** A valve in which all ports are closed in the center position.
- **DETENT POSITIONED:** A valve which has a device to hold it in position until actuated by an external force.
- **FLOW DIVIDING:** A valve which divides the flow from a single source into two or more branches at constant ratios regardless of the difference in resistances on the branches.
- **MANUALLY OPERATED:** A valve which is manually actuated and positioned.
- **MECHANICALLY OPERATED:** A valve which is mechanically actuated and positioned.
- **OPEN CENTER:** A valve in which all ports are interconnected in the center position.
- **SHUTTLE:** A connective valve which selects one of two or more circuits because flow or pressure changes between the circuits.
- **SURGE DAMPING:** A valve which prevents shock by controlling the rate of acceleration of fluid flow.
- **THREE POSITION:** A valve having three positions to give three selections of flow conditions.
- **TWO POSITION:** A valve having two positions to give two selections of flow conditions.

time saver series
CONSTRUCTION COST ESTIMATING PART 9

INSULATION—PIPE AND BLOCK

Costs presented here relate to the insulation of steam lines and tanks, using either formed pipe insulation or blocks. Figures have been set up for 85% Magnesia, calcium silicate and diatomaceous earth-silica combinations. Magnesia is used for temperatures up to 600 F; calcium silicate, up to 1200 F. For higher temperatures, combinations of calcium silicate and diatomaceous earth are applied in sufficient thickness to reduce the temperature at the outer surface to 600 F, then magnesia insulation can be used to further reduce the temperature.

Magnesia and calcium silicate cost the same, have the same insulating value and weigh 12 lb per cu ft. They are molded insulations.

These insulations must be applied with joints tightly butted together and securely wired in place (three loops of wire per length of insulation on pipes up to 6 in.; four loops of wire per length on larger sizes.) All double standard thickness insulation should be applied with staggered joints and each layer wired separately in place. Pipe insulated with double standard insulation will be better insulated than pipe insulated with solid insulations of equal thickness.

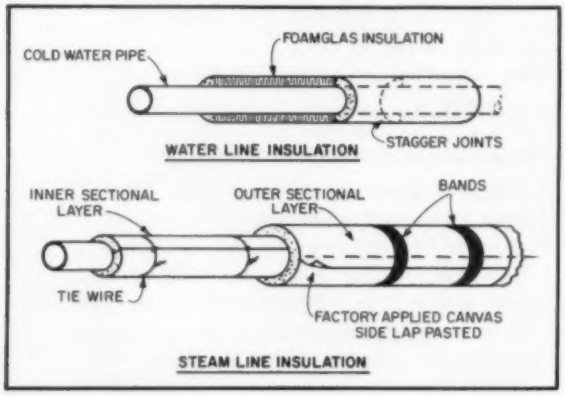
In high temperature installations it is possible to reduce the thickness from, for example, 5 in. to 4 in. by using two 2-in. layers and still obtain a higher efficiency than with the single 5-in. thickness.

Magnesia and calcium silicate insulation for ½-in. through 12-in. pipe sizes is furnished in horizontally-split sections three feet long. Over this size, it is furnished in quarter sections.

Cost to insulate fittings: twice lineal foot cost
Cost to insulate flanges: triple lineal foot costs
Cost to insulate elbows: 1½ times lineal foot cost

TABLE I. Magnesia, silicate pipe insulation cost per foot

Pipe Size	Up to 375F Standard (1 in.)		Up to 500F 1½ in. Thick		Up to 600F 2 in. Thick		Up to 750F Dbl. Std. Thick	
in.	Material	Total	Material	Total	Material	Total	Material	Total
½	$0.248	$0.78	$0.519	$1.47	$0.847	$2.00	$0.734	$1.60
¾	.271	.78	.553	1.47	.904	2.00	.791	1.60
1	.305	.78	.587	1.47	.960	2.00	.847	1.60
1¼	.339	.85	.632	1.58	1.017	2.14	.904	1.75
1½	.372	.93	.678	1.70	1.073	2.29	.960	1.95
2	.406	1 03	.723	1.81	1.130	2.43	1.017	2.10
2½	.452	1.13	.791	1.98	1.186	2.57	1.130	2.25
3	.508	1.27	.858	2.15	1.299	2.85	1.243	2.36
3½	.565	1.41	.926	2.32	1.412	2.90	1.356	2.56
4	.678	1.60	.994	2.40	1.523	3.08	1.582	3.06
5	.791	1.70	1.130	2.54	1.751	3.57	1.808	3.23
6	.904	2.00	1.243	2.80	1.921	3.82	2.034	3.40
8			1.525	3.45	2.260	4.95	2.825	7.08
10			1.864	3.55	2.712	5.11	3.277	8.20
12			2.090	3.94	3.051	7.40	4.633	11.60



The figures in Table I are calculated for situations where the work is being done at a height of less than 15 ft. If the work is being done between 15 and 25 ft above the ground, add 10 per cent to the cost; at a height of 25 ft or more, add 20 per cent to the cost.

These costs include a canvas jacket on the pipe insulation. If an aluminum jacket is used, the following costs must be added, for the aluminum:

Pipe Size, in.	Cost per lineal ft of pipe
2 and under	$0.30
3—4	.40
5—6	.50
8	.60
10	.70
12	.80

For insulating pipes over 12 in. in diameter, the cost of the aluminum jacket, .006 in. thick and corrugated, is $0.16 per sq ft. For outside work the aluminum jacket should be banded every 6 in.; for inside work, every 9 in.

To obtain the cost of a job using various sizes of insulation, take total material cost and multiply this figure by 2.5. For small power plant figuring, use the factor 3.25; large power plants, 5.25, and for utility plants, the factor is 6.

Magnesia Block Insulation Costs

Thickness	Temp. Range	Material Cost	Labor Cost	Total Cost per sq ft
1 in.	up to 375	$0.56	$0.83	$1.39
1½ in.	375 to 500	.83	1.25	2.08
2 in.	500 to 600	1.11	1.67	2.78

For refrigeration or chilled water piping, hangers must be insulated if they are fastened to the piping. When insulating piping at a temperature below 40 F, the joints in the insulation should be vertical as well as staggered. See the sketch.

The insulation of brine or ammonia lines, which requires thicker insulation, involves many variables. In these instances, it is recommended that an insulating contractor be consulted for estimates.

Cellular glass insulation (Foamglas, manufactured by Pittsburgh Corning Corp.) is used for water lines at temperatures under 50 F. For water, low pressure steam or hot water lines where the temperature is within the range of 50 to 300 F, Foamglas commercial pipe insulation can be used. This insulation is the same price as magnesia insulation; it weighs 9 lb per cu ft, is resistant to moisture, and has a compressive strength of 7 tons per sq ft.

TABLE II. Cellular glass insulation cost per foot

Pipe Size in.	Incoming Water Temp. 1 in. Thick Material	Total	Chilled to 40F 1½ in. Thick Material	Total	Less Than 40F 2 in. Thick Material	Total
¼	$0.75	$1.01	$1.00	$1.35	$1.20	$1.62
⅜	.75	1.01	1.00	1.35	1.20	1.62
½	.75	1.01	1.00	1.35	1.20	1.62
¾	.80	1.08	1.10	1.49	1.30	1.75
1	.90	1.22	1.20	1.62	1.50	2.02
1¼	1.00	1.35	1.30	1.75	1.70	2.29
1½	1.05	1.42	1.40	1.89	1.90	2.57
2	1.20	1.62	1.60	2.16	2.10	2.84
2½	1.30	1.75	2.00	2.70	2.50	3.38
3	1.65	2.23	2.20	2.97	2.90	3.92
3½	2.00	2.70	2.60	3.51	3.20	4.32
4	2.40	3.10	3.00	4.15	3.50	4.73
5	3.15	4.25	3.50	4.73	4.40	5.95
6	3.60	4.86	4.20	5.67	5.10	6.89

For computing the cost of insulating cold or chilled water lines, use Table II. These figures do not include the cost of a protective jacket. If a jacket is required of glass fabric or aluminum foil, multiply the material costs by 1.48; this will be the total cost of Foamglas installed with a jacket.

Prices in Table II include elbows (welded) and hangers in the pipe line. For flanges, use the outside diameter of the flange and compute costs for that size. If hangers are fastened to the pipe, the hanger should be insulated for a distance of 6 in. and sealed off.

Cellular glass is furnished in 18-in. lengths. Edges of the insulation should be covered with approved cement, and four bands per section used to hold the insulation in place. Joints should be staggered.

Foamglas commercial insulation is used for hot and cold water lines, for low pressure steam lines with temperatures ranging between 50 and 300 F. It is furnished in 24-in. lengths with a kraft-foil laminate jacket. Thicknesses, 1 in. and 1½ in. For insulating piping under 4 in. in diameter, use 1-in. insulation; for piping 4 to 6 in. in diameter, use 1½-in. insulation.

Longitudinal lap sealed with lap cement; end joints sealed with vapor barrier strips and lap cement.

Total installed cost is the same as that for equal thicknesses of calcium silicate or 85% magnesia.

Foamglas Insulation; Floors, Sandwich Panels

Thickness	Laying Cost	Material Cost	Cost per sq ft	Total Incl. OH & Profit
1 in.	$0.05	$0.145	$0.195	$0.24
2 in.	.05	.290	.34	.41
3 in.	.05	.435	.485	.59

Cork insulation is furnished in 36-in. sections; to install, these sections are cemented together and the insulation is wrapped with No. 12 copper clad steel wire, on 6-in. centers. Any deep impressions in the cork should be filled with brine putty, the seams filled and the insulation painted with asphalt paint. To offset the tendency of cork insulation to dry out, painting should be done about every three years.

Cork insulation costs 30 per cent more than the cellular glass insulation listed in Table II.

Underground Insulation

Where an underground pipe trench is to carry several small-diameter pipe runs, 2-in. diameter and under, insulate each line with 2-in.-thick cellular glass having factory-applied cover; mop lap and seal joints with asphalt. Installed price will be equal to the 2-in.-thick Foamglas costs shown in Table II.

In trenches where larger pipe runs are placed, or where there is a large number of small-diameter pipe runs, the lines should be buried in a granular insulation. Where required, such as in long steam line runs, 3-in. concrete pads should be provided. Average cost for these pads is $0.50 per sq ft.

If the pipes are at different temperatures, and temperature is to be controlled, space the pipe runs 4 in. apart. There should be 6 in. of granular insulation around the outside of the nest of pipes.

Granular insulation costs can be estimated at $2.00 per cu ft of trench. If the pipes in the trench are large diameter, deduct their area from the total cross-sectional area of the pit; ordinarily the areas of small pipe sizes are not considered in estimating.

Report on

AIPE MEETING—ALL ENGINEERS DINNER

R. H. Morris, L. C. Morrow Receive Fellow Awards

AIPE President W. C. Wallin presides at the annual meeting of the Board of Directors. Other 1959-1960 officers at the head table are, left to right: F. G. Fryberger, secretary; J. M. Weeks, Proto Tool Co., Los Angeles, Calif., vice pres.; Kay Buchanan, admin. secretary; Wallin, Western Electric Co., Winston-Salem, N. C., and L. Monty, treasurer.

ON JANUARY 24 the Board of Directors of the American Institute of Plant Engineers held their annual meeting at the Sheraton Hotel in Philadelphia, Pa.

Newly-elected officers of the AIPE are: Fred G. Fryberger, Food Machinery and Chemical Corp., Baltimore, Md., president; Gerald W. Austin, Gulf Atlantic Warehouse Corp., Houston, Texas, vice president; Joseph N. Jacques, Lakeside Laboratories, Milwaukee, Wis., secretary; and Leo Monty, Artisan Metal Products, Inc., Waltham, Mass., treasurer. The new officers will be installed at an Executive Committee meeting which is scheduled to be held in California in June, 1960.

The All Engineers Dinner, attended by over 300 AIPE members and guests, was the highlight of AIPE activities at the Plant Maintenance and Engineering Show and Conference. John Waligora, of Merck Sharp and Dohme, Div. of Merck & Co., Inc., and national past president of the Institute was chairman of the dinner committee. He also served as master of ceremonies on the dinner program which featured Rear Admiral Eugene J. Peltier as guest speaker.

AIPE President W. C. Wallin, made the presentation of the Fellow Awards which are given annually to honor individuals who have made outstanding contributions in the field of plant engineering. This year's recipients were: Richard H. Morris, Editorial Director of PLANT ENGINEERING magazine, and L. C. Morrow, General Chairman, Plant Maintenance and Engineering Conference.

Several interesting comments were made by Rear Admiral Peltier in his speech "The Navy and Plant Engineering." Here are a few quotes from his talk:

"In our efforts to improve maintenance, we were proposing to set up a system that would be applicable to a wide range of activities.

"Where to begin? We began with a skeleton—and the skeleton consisted of 10 basic elements for each of the maintenance management programs.

"The first of these is inventory. We had to know what we have to maintain so we had to list all items to be maintained. The second element is standards (or levels of) maintenance. While under-maintenance leads to damage, over-maintenance can lead to waste. We wanted no part of either one.

"The next two elements consist of functional controls: They are: A system for controlling work input (including maintenance inspection) and planning and estimating. The next three elements related to the direct support of the work performed. They consist of material coordination, work scheduling and job planning.

Over-all view of the members and guests attending the All Engineers Dinner. Guests seated at the speakers table, below, are, back row, l to r: O. Graveley, AIPE Fellow; L. Monty, treasurer; G. Austin, vice president-elect; S. A. Simonson, past president; W. C. Wallin, national president; Rear Admiral E. J. Peltier; J. Waligora, past president; Mrs. Waligora; F. Fryberger, president-elect; Captain Reedy, USN; and Mr. Gennetti, Mayor's Office, City of Philadelphia. Front row, l to r: H. W. Shockley, Wilmington Chapter; K. D. Hamilton, AIPE Fellow; T. Parlon, Yale & Towne; R. Loetscher, University of Wisconsin; L. Eschner, Philadelphia Chapter; Mrs. Tou; V. Tou, Valley Forge Chapter; K. Buchanan, administrative secretary, AIPE; J. N. Jacques, secretary-elect; Mrs. Morris; Richard H. Morris, recipient of the 1960 Fellow Award; and R. E. Robbins, of the Wilmington Chapter.

"The last three elements are designed to assist management in making judgements and decisions—in order that corrective action may follow—and that the performance may be made a matter of record. They consist of a reporting system, a procedure for review, and a procedure for corrective action.

"All of this may seem unduly complex and confusing. If I were to extract the most significant aspects of it, I would emphasize work input control, planning, estimating work, scheduling and performance evaluation." **End**

President Wallin presents Fellow Award to R. H. Morris, Editorial Director of Plant Engineering magazine, for his outstanding contributions in the field of plant engineering.

Rear Admiral Eugene J. Peltier, CEC, USN, Chief, Bureau of Yards and Docks, was the guest speaker of the evening. He talked about "The U. S. Navy and Plant Engineering."

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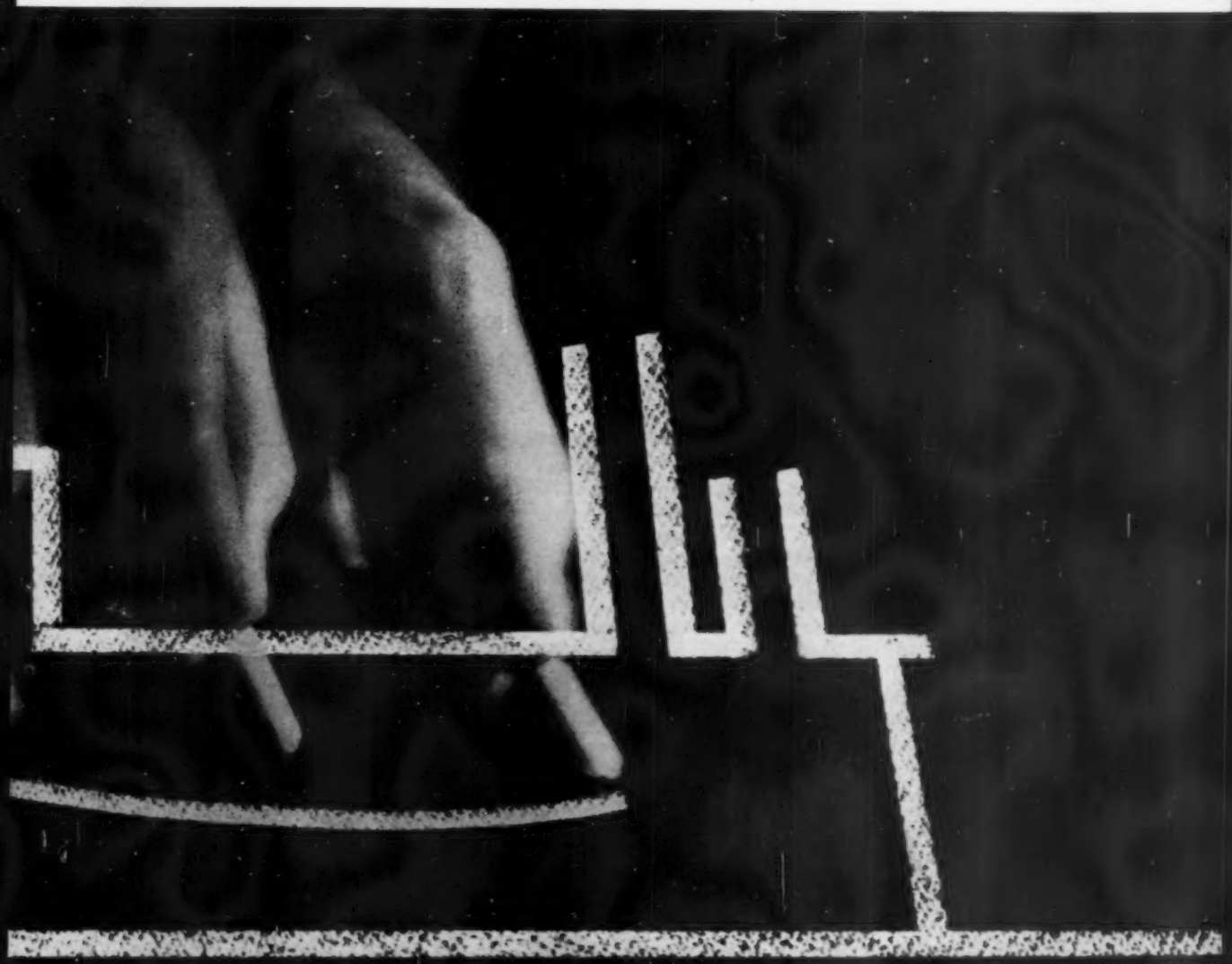

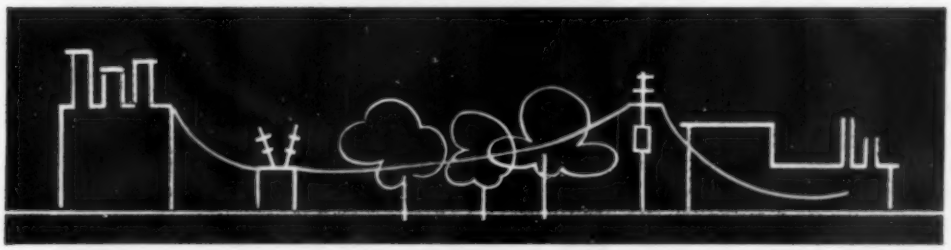

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PLANNING CUTS STORAGE, PAINTING SPACE

Twenty-four hour air-dry for cumbersome cylinders complicated handling and storage at Douglas

A TYPICAL EXAMPLE of how a "look before you leap" attitude can be made to pay big dividends occurred recently at the Long Beach, California Division of Douglas Aircraft Company where, as part of a missile ground support program, it became necessary to prime and paint large liquid oxygen bottles 20 ft long, 10 in. in diameter, and weighing 1200 lb. The problem was further complicated by a specification requirement that the bottles be air-dried for 24 hours after painting before subsequent handling.

Normally, the setup for accomplishing a job like this would require heavy handling equipment for unloading the incoming bottles and transporting them to a paint booth, a large plant floor area for air-drying the bottles after painting, then more heavy handling equipment for the outgoing painted bottles.

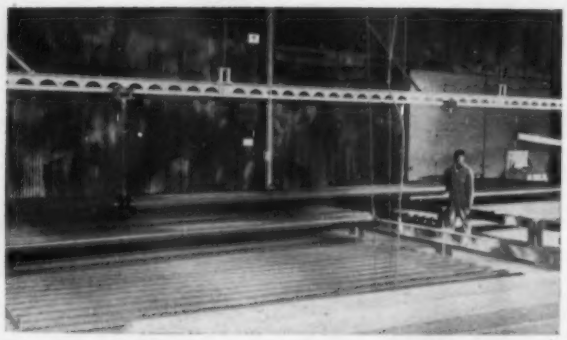
But while surveying existing facilities with an eye to accomplishing this job, Douglas plant engineers noted that one large paint booth built against a plant wall was just opposite a canopied loading platform on the outside of the wall. They noted also that each oxygen bottle was equipped with heavy end hanger fittings sufficiently strong to support the bottle. These fittings were not painted so the bottle could be handled by them at any time, even immediately after wet paint application. Here, then, was the obvious solution to the problem.

The first job was to cut two holes in the outside wall so that a 10-in. I-beam, oval-shaped conveyor track could be installed, leading from the loading platform, through the wall and through the paint booth, back through the wall and out onto the loading platform again.

Next, two sets of 20 ft wide roller tracks were installed on the loading platform—one for the incoming bottles, one for the outgoing. Spacing of these tracks made it possible to suspend the oxygen bottles between them with the weight resting on the end fittings.

Now incoming bottles are unloaded onto one set of tracks, rolled into position under a hoist, then hoisted so that they can be attached by their end fittings to a pair of conveyor trolleys. The bottles are then hand-shoved around the conveyor, through the paint booth, and out over the loading platform again. When they arrive over the second set of roller tracks, they are lowered onto the tracks and once again rest on the end fittings during the required 24 hour air dry.

This simple setup, utilizing existing facilities except for the conveyor, greatly minimizes heavy handling, and, in addition, eliminates the use of extra floor space inside the building for a drying area. **End**



Storage racks, on shipping platform, for both painted and unpainted bottles cut in-plant needs for storage space. One of the oxygen bottles is being removed for painting.

Just before this spray painting operation, the bottle was shoved along on the monorail conveyor from the storage area to the paint booth, located just inside the plant wall.

After painting, the bottle is moved through the hole cut in the plant wall. It will now be stored on 20-ft wide roller tracks where it will remain for a 24-hour period of air drying.

For more facts circle 565 on Reply Card——→

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This book is not advertising matter, and it contains no catalog data. It is costly to produce and the quantity is limited but plant and building operating and maintenance executives and others who install and maintain valves are more than welcome to a copy. Ask your local Jenkins distributor for it.

THE CONTENTS, and the purpose of this book, are given in the following Foreword; page 1 ...

"Valve economy is an objective of good plant management at all times. It is more important than ever today because of the greatly increased costs of valve replacement and maintenance that have paralleled the rise in all expenses of plant operation.

Most valve failure can be prevented before it starts. But to prevent failure, and insure the efficient operation of valves that contributes to plant productivity, four rules must be constantly followed: proper *selection*, correct *installation*, adequate *inspection*, and experienced *maintenance*.

This booklet has been prepared for plant management and supervisors, to explain and illustrate the principal causes of valve failure, how to prevent similar failures, and how to repair damaged valves. In addition to general instructions for installation and maintenance, it includes several examples of actual valve damage and destruction which have been brought to the attention of Jenkins Engineers. In each case the relatively simple precautions that would have prevented such needless waste are clearly explained, in non-technical language."

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STATIC ADJUSTABLE SPEED D-C DRIVES

By S. E. MORGAN and E. H. VEDDER, System Control Division, Westinghouse Electric Corporation, Buffalo, New York

UNTIL RECENTLY, the limited power-handling ability of static components has restricted their application in industrial control systems to low-power control circuits. In such use, a major objective has been to replace relays and electronic tubes.

Static components have now been developed to the point where they are of great importance in power circuits. Major improvements in materials used for cores in transformers and reactors have played a major part in bringing this about, but even more important are recent advances in semiconductors. It is these developments that have made it possible to extend the magnetic amplifier principles beyond nominal applications in control circuits, to applications in which large blocks of power are handled. Such was the tenor of the discussion at the 23rd Annual Machine Tool Electrification Forum sponsored by the Westinghouse Electric Corporation.

Package Drives

Another industry trend is evidenced as the growing popularity of the package-drive concept. The advantages afforded by completely factory-wired and tested units are obvious, but the tangible benefits, of course, show up in the final installed cost of such a drive. As new developments come into being, it will be the objective of the electrical industry to produce package drives at lower cost, maximum performance and flexibility and minimum physical size. Static power-conversion units represent a major step in this direction.

For example, silicon rectifiers show distinct advantages over their popular predecessor, the selenium rectifier. In addition to being much more compact than selenium units, silicon rectifier equipment is characterized by very low forward voltage drop, very high efficiency, and the absence of aging effects.

Basic principles used in static adjustable-voltage drives are not new but have been evolving since the days of the simple saturable reactor down through the magnetic amplifier used commonly in industry today. The manner in which these components are used in static power supplies for d-c motor drives can best be described by considering a constant-horsepower unit, where only the d-c motor field is controlled to provide adjustable speed, Fig. 1. Speed control ranges up to 4:1 are readily attainable by this arrangement for constant-horsepower loads. An actual unit of this type, Fig. 2, is rated 75 kw at 250-v, direct current. Many of these units are currently in service.

To incorporate adjustable-voltage features to provide wide speed-control ranges by armature-voltage control, power and control magnetic amplifiers are added, Fig. 3. In this case, note that speed-control rheostats are provided for both the armature control and motor field control. In this arrangement, a combined constant-torque and constant-horsepower speed range is available.

To better illustrate how the power magnetic amplifier is used in a complete motor drive, a more detailed schematic is shown in Fig. 4. Operating from a three-phase source, the power reactors and silicon rectifiers are connected directly to the line and the control circuit becomes

(Turn to page 152)

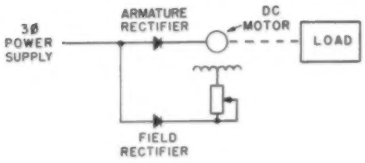

Figure 1
Simplified diagram of a static adjustable-speed, constant-horsepower drive.

Figure 2
Static power supply rated at 75 kw, 250 volts provides a 4 to 1 speed range.

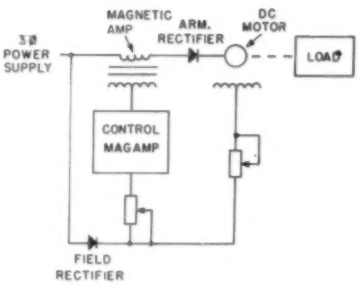

Figure 3
Control both armature and field for constant horsepower and constant torque.

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* * *

L. G. Schmeig began his career in Du Pont's Sales Service Laboratory 24 years ago, after completing his education at Temple University. Five years later he became a Du Pont Technical Representative servicing company-owned plants. Since then, he's been busy solving painting problems for architects, engineers and maintenance men in the fields of petroleum, marine, utilities and heavy chemicals. In 1958 he took over as Southwestern District Manager, Industrial Maintenance Sales.

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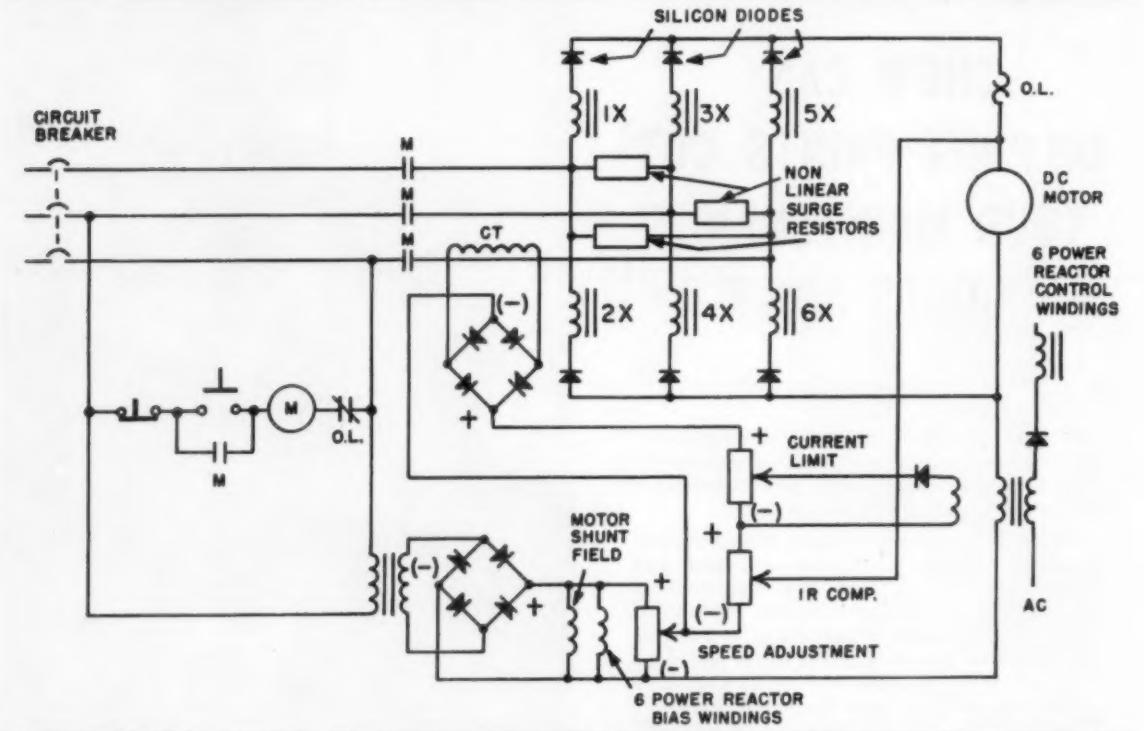

Fig. 4. Schematic diagram for a complete adjustable voltage drive using both armature control and motor field control.

energized when the "M" contactor is closed. A circuit breaker affords overcurrent protection.

Main windings of the power reactor, together with the silicon rectifiers, are connected in a three-phase bridge circuit. The silicon diodes are protected against voltage surges by means of nonlinear resistors shown in the schematic. In addition, voltage-dividing resistors are connected across each diode to insure equal distribution of a surge throughout the circuit.

Power reactors are designed as simple as possible by utilizing only a bias and speed-control winding. All other functions are incorporated in the control magamp. The basic unit uses a counter electromotive force regulator with current-limit or time-limit acceleration control. The circuit shown provides adjustable current-limit acceleration.

Necessity of some form of regulation is established by the speed-torque curves of a simple system without a regulator, Fig. 5. From the curves it is obvious that the inherent poor speed regulation of the drive is too great for most applications.

In contrast with the curves just examined, those in Fig. 6 apply when a regulator has been added to the system. With the compensation set for essentially flat regulation at 20 per cent of top speed, the drive will perform with regulation within about 5 per cent of top speed.

A typical drive unit, Figs. 7 and 8, is rated at 40 hp with a blower, or 30 hp without the blower. In the front view, Fig. 7, the major components are identified from top to bottom as the control magnetic amplifier panel, the a-c control panel with incoming line circuit breaker and starter and, at the bottom, three of the six power reactors mounted

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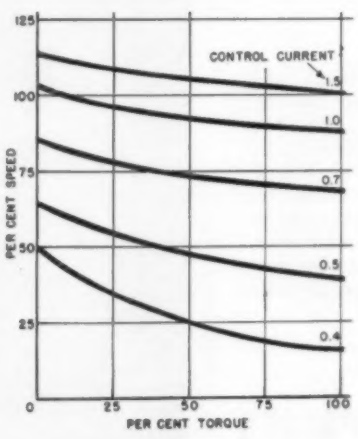


Figure 5

Speed torque curves for reactor-controlled rectifier drive without regulator.

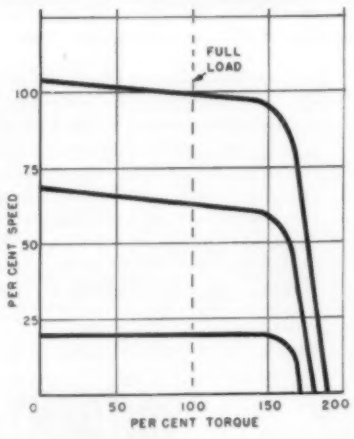


Figure 6

Same drive as Fig. 5, with voltage regulation set at 20 per cent of top speed.

MATERIALS-HANDLING NEWS

NEW AND UNUSUAL APPLICATIONS OF BASSICK CASTERS THAT MIGHT BE ADAPTED TO YOUR HANDLING PROBLEMS

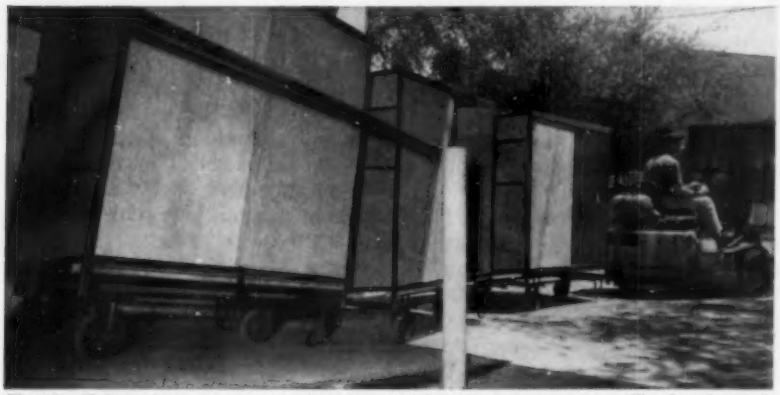
Jantzen tries "new kind" of caster... eliminates 98% of wheel replacements

Maintenance and materials handling men at Jantzen, Inc., manufacturers of beach and sportswear in Portland, Oregon, have solved a handling problem common to many concerns with buildings spread out over a sizeable area.

They did it by putting Bassick Floating Hub casters on transport trucks towed in trains of two to six units by power trucks for inter-building service.

Almost immediately, trucks equipped with Floating Hub casters stopped showing up on maintenance and replacement records. After five years of continuous service only 3 out of more than 160 Floating Hub casters have had to be replaced. Standard caster previously used had required replacement after 6 to 8 months.

Truck trains move at up to 15 mph over rough asphalt roadways. With Bassick Floating Hub casters, however, casters last longer, and wear and tear on trucks and roadways is greatly lessened.



Floating Hub casters on power-pulled trucks got trial run 5 years ago . . . are still going strong at Jantzen, Inc. Life of caster used previously: 6-8 months.

Behind this dramatic product, Jantzen beachwear, is an almost equally dramatic story of materials handling: caster replacement cut 98%.

Fragile Product—No! Shock Absorbing Caster—Yes!

Many companies handling materials which are not delicate, fragile nor breakable are turning to Bassick Floating Hub casters. Why? Shock absorbing construction equips these casters for extremely rough service in power pulled applications. As a result, maintenance and replacement of casters, trucks, floors or roadways is drastically reduced.

Case Hardened Casters

At Bassick 6 heat treating furnaces, other modern equipment, housed in a special department, handle approximately 5,000,000 pounds of heat treated work per year. Ball races and other parts of Bassick casters are case hardened to increase life under heavy loads, prevent wear in ball bearings. One more reason Bassick casters roll longer.

Another Caster for Minimum Maintenance

Bassick Grooved wheel casters operating on inverted angle iron tracks require minimum maintenance provide maximum efficiency. Wherever materials must move often over same route, consider an inexpensive track set up and Bassick Grooved Wheel casters. Grooved Wheel casters operate both on and off tracks—provide positive control of loads.

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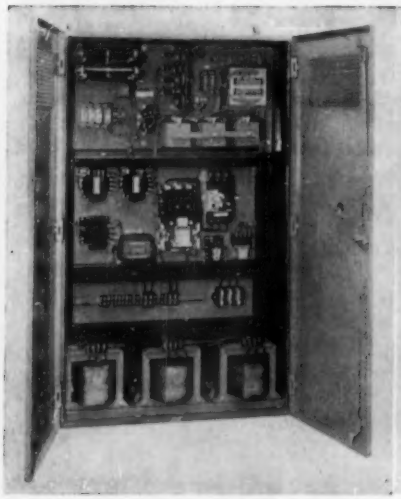


Fig. 7. Front view of typical 40 hp, 440 volt adjustable voltage drive.

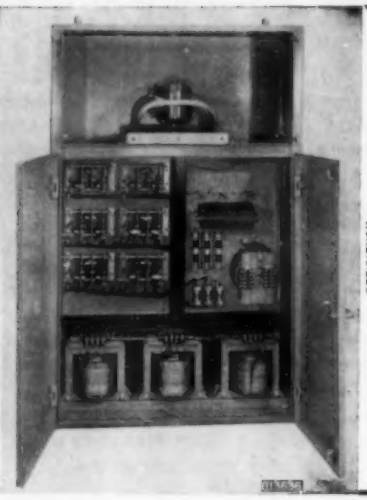


Fig. 8. Rear view of Fig. 7. Without blower, this unit is rated 30 hp.

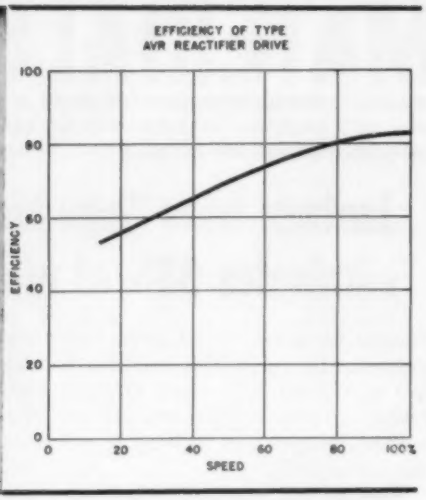


Fig. 9. Efficiency curve of typical AVR Reactifier drive ranges from 70 to 83 per cent.

on the cabinet floor. In the rear view, Fig. 8, we see the d-c and constant-potential exciter for control circuits and motor field. The remaining three power reactors are shown at the bottom of the cabinet.

The principal advantages that industry can expect from drives of this type are high efficiency of the overall system. Efficiency above half speed is in the range of 70 to 83 per cent, Fig. 9. In contrast, typical efficiency for an m-g set ranges from 63 to 73 per cent.

Low maintenance, long life, and extreme reliability of the power package can also be expected. The magnetic amplifiers, power reactors, and silicon diodes provide the benefits now established as characteristic of static control components. Another advantage is elimination of the direct-current contactor. Since the opening and closing of the power circuit is performed ahead of the rectifiers, the advantages of a-c interruption are made available to the user.

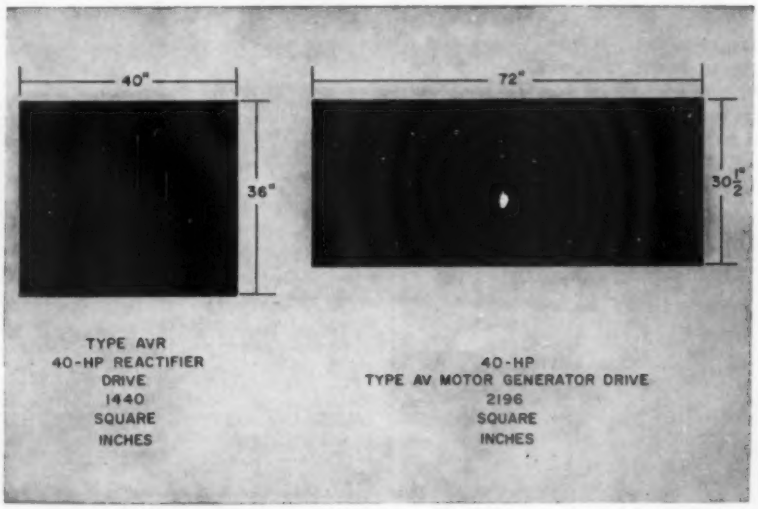
Compactness of design requires but minimum floor space. Figure 10 shows a comparison between the floor space required for the 40-hp static drive we discussed earlier and an equivalent drive of the motor-generator type. Reduced-voltage a-c starters are never required since inrush currents are low because of the fact that the power circuit is closed on unsaturated reactors.

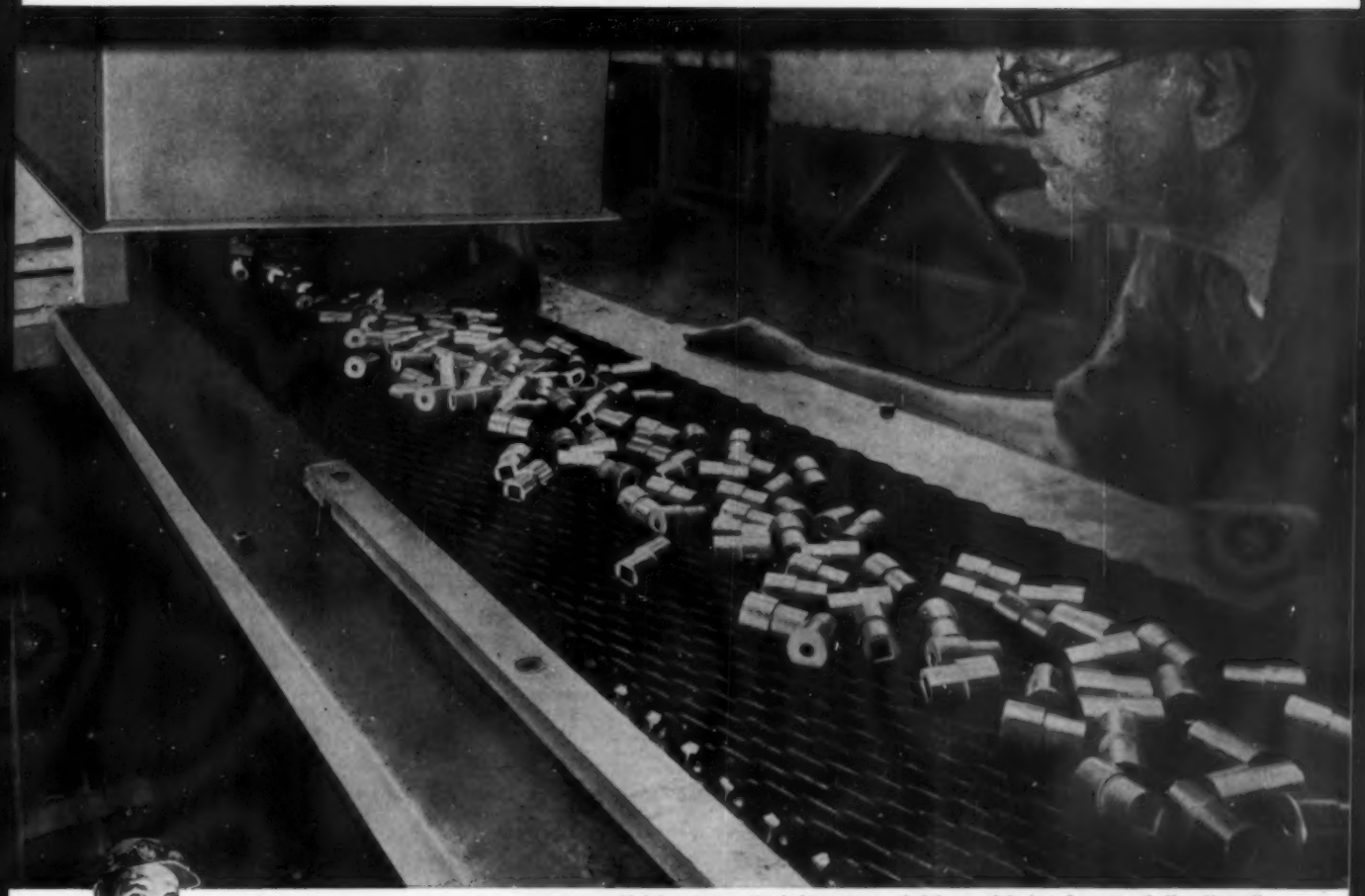
We also have the most desirable features of normal Ward Leonard drive systems that use m-g sets. These features include wide speed ranges, smooth stepless control over acceleration and deceleration, dynamic braking, adjustable inching or threading speeds, and compatability with the various types of functional regulators operating over the entire speed range.

One characteristic not available in the Reactifier Drive, as we have named this system, is regenerative braking. It is obvious that the blocking action of the silicon diodes would prevent any reverse flow. However, in many applications, this feature can be approximated by the use of dynamic slowdown or the intermittent application of dynamic braking during speed changes.

Applications of these drives appear to be essentially unlimited, except for certain cases in which the fast-acting and stepless function of regenerative braking is essential. These would be chiefly encountered in connection with highly accurate regulation systems with high inertia loads. Otherwise, these drives are immediately practical and available for application in the machine tool and automotive industries, to such machines as lathe drives, grinders, boring machines, press feed drives, conveyors, test stands and many others. **End**

Fig. 10. Comparison of 40-hp adjustable speed drives based on areas occupied.





Metal components being conveyed into a sintering furnace at the Norwalk Powdered Metal Products plant. These components ride on a Wissco Belt through temperatures up to 2050° F.

This is the image of CF&I. He symbolizes the modern manufacturing techniques that assure the long-range dependability of all CF&I steel products, including Wissco Metal Belts.

FAMOUS NAMES
ride on WISSCO BELTS
Norwalk Powdered Metal Products, Inc.

The story of Wissco Belts is best told by their users: For instance, Mr. Harry Moss, Production Manager for Norwalk Powdered Metal Products, Inc., of Norwalk, Conn., reports:

"We use Wissco Belts exclusively because they last so long and because they can be replaced within minutes. In the course of its working lifetime, the average Wissco Belt we employ conveys 25 million powdered metal parts through sintering furnaces—at temperatures up to 2050° F, 24 hours a day. We are sold on Wissco Belts because they last an average of four months longer than competitive belts."

The durability of Wissco Belts was stressed by an incident which happened one weekend when the furnace was unattended. A failure of the driving mechanism occurred on the furnace, immobilizing the 60' x 12" Wissco Belt throughout Saturday and Sunday. Norwalk's production department was impressed by the fact that the section of the belt within the furnace withstood this unnatural concentration of heat so successfully during the entire period. This belt is still being employed, without any repairs required.

There's a Wissco Belt designed for every processing-conveying operation. A CF&I engineer will be glad to survey your production set-up and recommend the Wissco Belt that will make your operation more efficient and economical. For complete information, call the nearest CF&I sales office.

WISSCO BELTS
THE COLORADO FUEL AND IRON CORPORATION

CF&I STEEL

In the West: **THE COLORADO FUEL AND IRON CORPORATION**
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In the East: **WICKWIRE SPENCER STEEL DIVISION** — Atlanta • Boston Buffalo • Chicago • Detroit • New Orleans • New York • Philadelphia

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WHAT IS THE BOILER OUTPUT?
Convert Nominal Rating to Actual Output

By JOSEPH A. HOHENLEITNER, Continental Boiler Div., Boiler Engineering & Supply Co., Inc.

A CONSIDERABLE number of pages of discussion has been printed regarding the acceptance of boiler horsepower versus pounds of steam per hour figures to rate modern present day automatic packaged boilers.

The "from and at 212 F" rating in pounds per hour of steam has questionable significance. Steam is never generated at 212 F from feedwater at 212 F. Actually, make-up temperature may be as low as 40 F. Automatic packaged boilers are built for pressures up to 250 psig corresponding to a steam temperature of 406 F. Thus, considerable heat must be added to the boiler water prior to the addition of latent heat required.

Although the heat of vaporization decreases slightly as boiler pressure increases, the additional heat required by the boiler water to bring it to steaming temperature has the net result of reducing the nominal "from and at 212 F" ratings.

Thus a 100-hp boiler, nominally rated to produce 3450 lb per hr of steam is going to produce considerably less steam under the operating conditions of temperature and pressure mentioned previously. See boxed information.

(Turn to page 158)

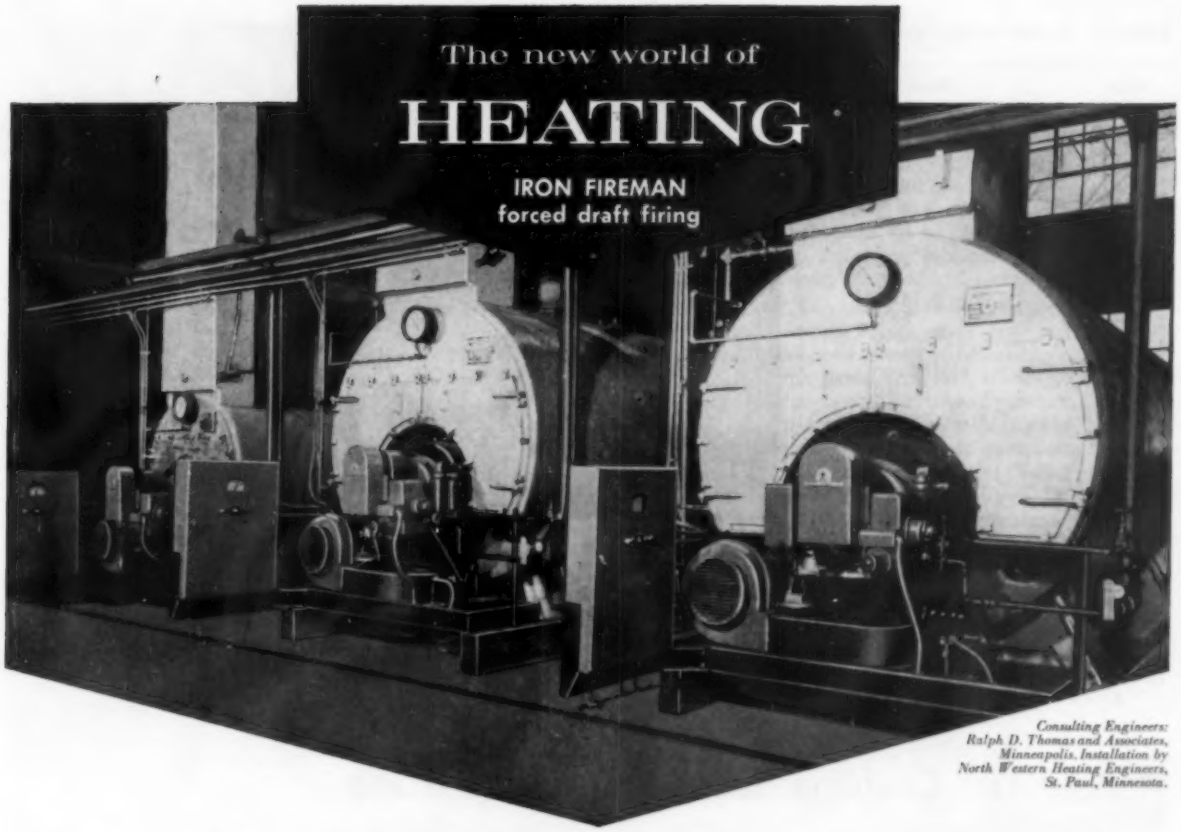
$$\text{lb/hr (actual)} = \frac{\text{Heat of Vaporization at 212 F}}{\left(\begin{matrix}\text{Total Heat in Vapor at}\\ \text{Actual Steam Temp.}\end{matrix}\right) - \left(\begin{matrix}\text{Heat in Feedwater}\\ \text{at Makeup Temp.}\end{matrix}\right)} \times \begin{matrix}\text{lb/ hr Capacity}\\ \text{(from and at 212 F)}\end{matrix}$$

Filling figures in this formula from published steam tables shows that the available steam will only be about 80 per cent of the "from and at 212 F" figure:

$$\frac{970.33 \text{ Btu/lb}}{(1201.7 \text{ Btu/lb}) - (8.05 \text{ Btu/lb})} \times 3450 \text{ lb/hr} = 2801 \text{ lb/hr}$$

Table I. The normal boiler horsepower outputs can be converted to the actual steaming rates by multiplying by factors corresponding to actual steam gage pressures (across top) and the boiler feedwater temperatures (extreme left column).

Feed-water Temp.	Steam Gage Pressure Psi																	
	0	2	10	15	20	40	50	60	80	100	120	140	150	160	180	200	220	240
	Pounds of Dry Saturated Steam per Boiler Horsepower																	
30	29.0	29.0	28.8	28.7	28.6	28.4	28.3	28.2	28.2	28.1	28.0	28.0	27.9	27.9	27.9	27.9	27.9	27.8
40	29.3	29.2	29.1	29.0	28.9	28.7	28.6	28.5	28.4	28.3	28.2	28.2	28.2	28.2	28.2	28.1	28.1	28.1
50	29.6	29.5	29.3	29.2	29.1	28.9	28.8	28.8	28.7	28.6	28.5	28.5	28.4	28.4	28.4	28.3	28.3	28.3
60	29.8	29.8	29.6	29.5	29.4	29.2	29.1	29.0	28.9	28.8	28.8	28.7	28.7	28.6	28.6	28.6	28.6	28.5
70	30.1	30.0	29.9	29.8	29.7	29.5	29.4	29.3	29.2	29.1	29.0	29.0	28.9	28.9	28.9	28.8	28.8	28.8
80	30.4	30.3	30.1	30.0	30.0	29.8	29.6	29.6	29.5	29.3	29.2	29.2	29.2	29.2	29.1	29.1	29.1	29.0
90	30.6	30.6	30.4	30.3	30.2	30.0	29.9	29.8	29.7	29.6	29.5	29.5	29.4	29.4	29.4	29.3	29.3	29.3
100	30.9	30.8	30.6	30.6	30.5	30.3	30.2	30.1	30.0	29.8	29.8	29.8	29.7	29.7	29.7	29.6	29.6	29.6
110	31.2	31.2	30.9	30.8	30.8	30.6	30.4	30.3	30.2	30.0	30.0	30.0	30.0	30.0	29.9	29.9	29.8	29.8
120	31.5	31.4	31.2	31.2	31.1	30.8	30.7	30.6	30.5	30.4	30.3	30.3	30.2	30.2	30.2	30.1	30.1	30.1
130	31.8	31.7	31.5	31.4	31.4	31.1	31.0	30.9	30.8	30.7	30.6	30.6	30.5	30.5	30.4	30.4	30.4	30.4
140	32.1	32.0	31.8	31.7	31.6	31.4	31.3	31.2	31.1	31.0	30.9	30.8	30.8	30.8	30.8	30.7	30.7	30.6
150	32.4	32.4	32.1	32.0	31.9	31.7	31.6	31.5	31.4	31.2	31.2	31.2	31.1	31.1	31.0	31.0	30.9	30.9
160	32.7	32.7	32.4	32.4	32.3	32.0	31.9	31.8	31.7	31.5	31.4	31.4	31.4	31.4	31.3	31.3	31.2	31.2
170	33.0	33.0	32.7	32.6	32.6	32.3	32.2	32.1	32.0	31.8	31.7	31.7	31.7	31.6	31.6	31.6	31.5	31.5
180	33.4	33.3	33.0	33.0	32.9	32.6	32.5	32.4	32.3	32.2	32.1	32.0	32.0	32.0	31.9	31.9	31.8	31.8
190	33.8	33.7	33.4	33.3	33.2	32.9	32.8	32.7	32.6	32.5	32.4	32.4	32.3	32.3	32.2	32.2	32.1	32.1
200	34.1	34.0	33.7	33.6	33.5	33.2	33.1	33.0	32.9	32.8	32.7	32.6	32.6	32.6	32.6	32.5	32.4	32.4
212	34.5	34.4	34.2	34.1	33.9	33.6	33.5	33.4	33.3	33.2	33.1	33.0	33.0	33.0	32.9	32.9	32.8	32.8



Consulting Engineers: Ralph D. Thomas and Associates, Minneapolis. Installation by North Western Heating Engineers, St. Paul, Minnesota.

This new heating plant increased boiler capacity 70%, yet will return the investment in 7 years

The Minnesota Masonic Home in Minneapolis faced a problem that is familiar to many owners of old heating plants—should the old plant be modernized or replaced?

After a thorough study of several alternatives, the engineering firm of Ralph D. Thomas and Associates recommended a complete replacement. The three Iron Fireman-Kewanee boiler-burner units shown above provide extra capacity for future needs, while cutting steam costs so sharply that engineers estimated they will pay for themselves in seven years.

COMPLETE, PACKAGED FIRING SYSTEM

The first big saving was in installation—the three units were moved in intact. No boiler settings, no brickwork, no special wiring required. The factory assembled units included boilers, burners, forced draft air supply, wired and tested control panels and fuel systems, all mounted on a permanent base. Low operating costs were the result of high combustion efficiencies (reduced fuel bills) and low maintenance. With packaged installation, factory responsibility covers practically the entire job.

FOR OIL, GAS OR DUAL-FUEL FIRING

Oil models fire any grade of oil from No. 2 to No. 6. Gas models take any type of high or low pressure gas. With dual-fuel models, fuels can be switched at a moment's notice with either manual or automatic controls.

Mail coupon for full information.

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HEATING AND AIR CONDITIONING
AIRCRAFT COMPONENTS AND EQUIPMENT
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CONTROL INSTRUMENTS

Iron Fireman Mfg. Co., 3066 W. 106th St., Cleveland 11, Ohio
(In Canada, 80 Ward St., Toronto)

Please send complete technical description and specifications on Iron Fireman forced draft firing.

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City_____ State or Prov._____

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Table II. Sample ratings and outputs.

Boiler Horsepower	Steam, lb/hr (From and at 212 F)
20	690
30	1035
40	1380
50	1725
60	2070
70	2415
80	2760
100	3450
125	4313
150	5175
200	6900
250	8625
300	10350
400	13800
500	17250
600	20700

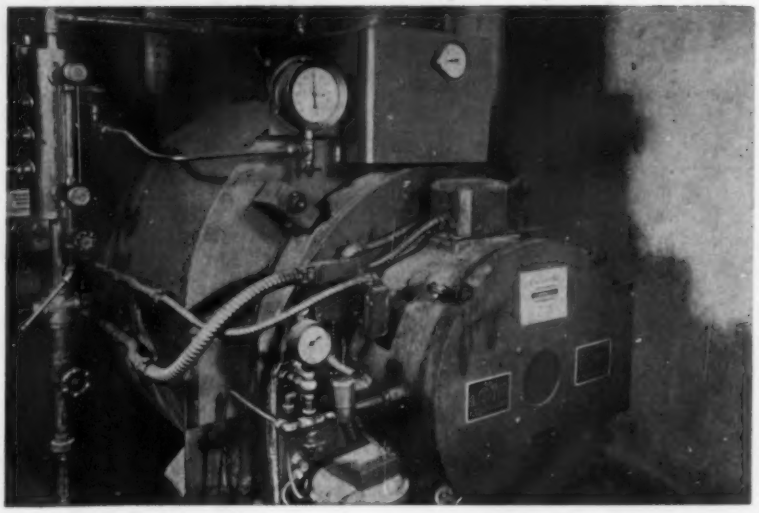


Fig. 1. Service output of this pilot plant boiler is below its nominal rating.

For anyone concerned principally with process steam loads the accompanying Table I makes the calculations simpler by reducing the nominal 34.5 pounds of steam per boiler horsepower for the given condition of feedwater temperature and boiler steaming pressure to the actual steam nozzle output of that particular boiler at full load.

With comfort heating loads, low steam temperature and high make-up temperatures from returning condensate make the problem only academic. **End**

Rubber Tire Coupling Keeps Pump On the Job

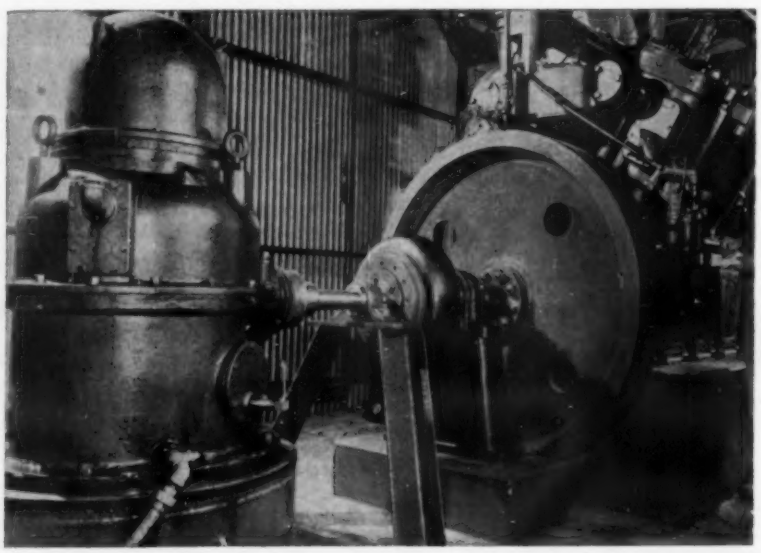
ELIMINATION OF every-two-month replacement of the coupling formerly installed, along with the necessity for periodic lubrication, has been accomplished by American Canals Company in Texas. The firm operates a system of pumping stations that deliver water to irrigation ditches at the rate of 32,000 gpm.

Necessity for replacing the former couplings every two months during the pumping season resulted in a heavy loss of pumpage. Ideally, the 175-hp gas engines and propeller pumps ran without interruption during the six-month-long growing season.

Following considerable investigation the company purchased and installed a "rubber tire" coupling. Besides offering exceptional capacity for handling angular and parallel misalignment, the coupling also had the ability to absorb torsional vibration and shock loads.

A 22-in. diameter coupling was installed as shown in the photo. Misalignment was about four degrees angular and ⅛ in. parallel. The coupling, made by Dodge Manufacturing Corporation, worked perfectly all season requiring no lubrication or other maintenance the company reported. Heart of the coupling is a tire with synthetic tension members bonded in rubber.

Twin flanges, which clamp the rubber tire in place and allow it to flex under stress, are mounted on the shafts by means of patented bushings. These bushings are reported to give the equivalent of a shrunk-on fit, in addition to permitting quick and easy application to shafts. Furthermore, the rubber-tire member can, when worn, be replaced without removing the flanges from the shafts. **End**



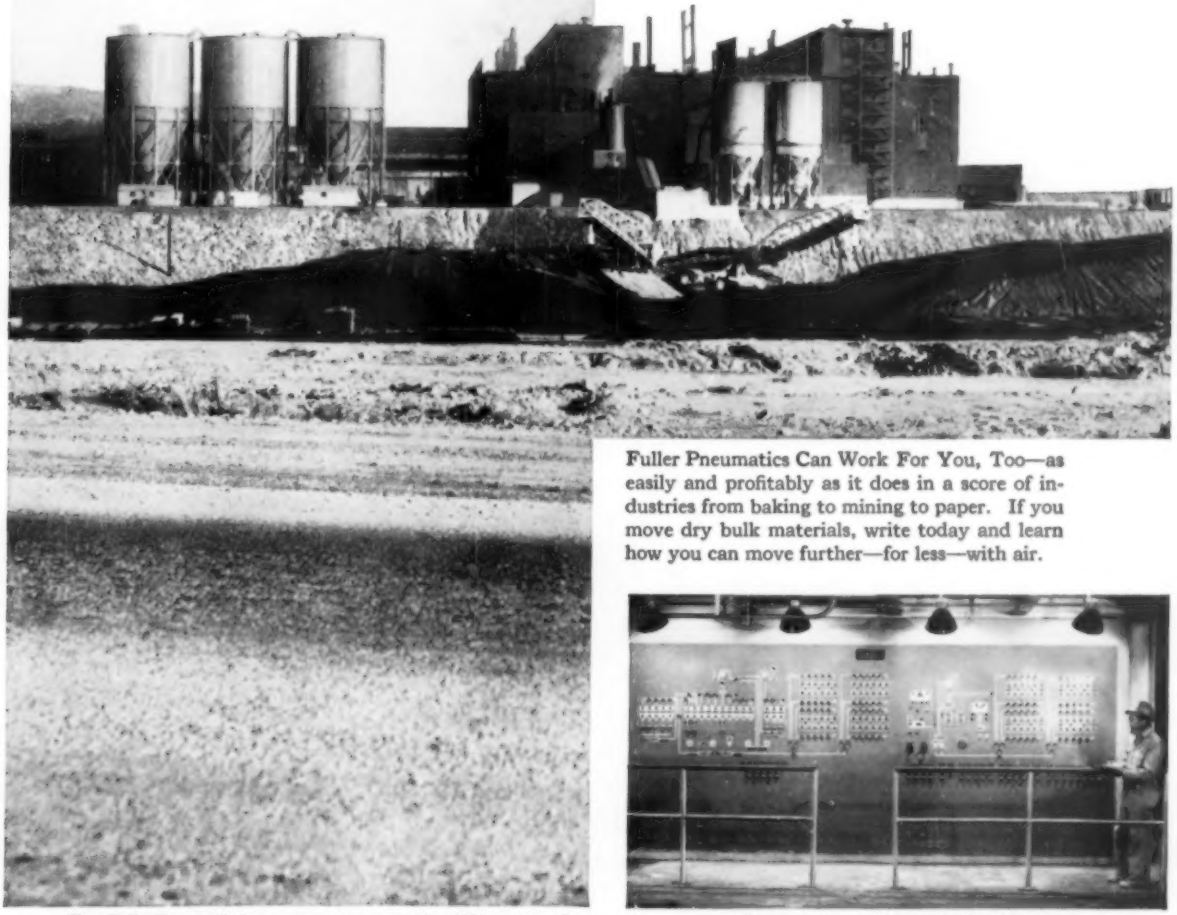
This "rubber tire" coupling connecting the gas engine and pump in Texas pumping station has eliminated periodic lubrication and too frequent replacement.

How Pneumatic Conveying Helps Make New Mining Process Economically Practical

Taconite processing is typical of the many varied, cost-saving applications for Fuller Pneumatic Conveying.

They're turning low assay iron ore into rich pellets on the Mesabi these days. Moving additives for pelletizing, Fuller plays a special role in this feat of engineering and production economy.

Fuller Pneumatic Conveying Systems are carrying fine anthracite screenings, soda ash, and bentonite from siding to storage to processing—with speed, safety, sanitation, and efficiency. With few moving parts to wear out and powered by inexpensive low-pressure air, Fuller Pneumatic Conveying Systems speed dry bulk materials *anywhere that a pipeline can be run:* under ground, up through floors, around corners . . . for far greater distances and at substantially lower cost than possible with mechanical conveyors.



Four Fuller Pneumatic Systems can speed more than 307 long *tons* of additives through this huge Taconite Pelletizing Plant in a single day.

Fuller Pneumatics Can Work For You, Too—as easily and profitably as it does in a score of industries from baking to mining to paper. If you move dry bulk materials, write today and learn how you can move further—for less—with air.

Centralized control is provided by giant panel designed and manufactured by Fuller.

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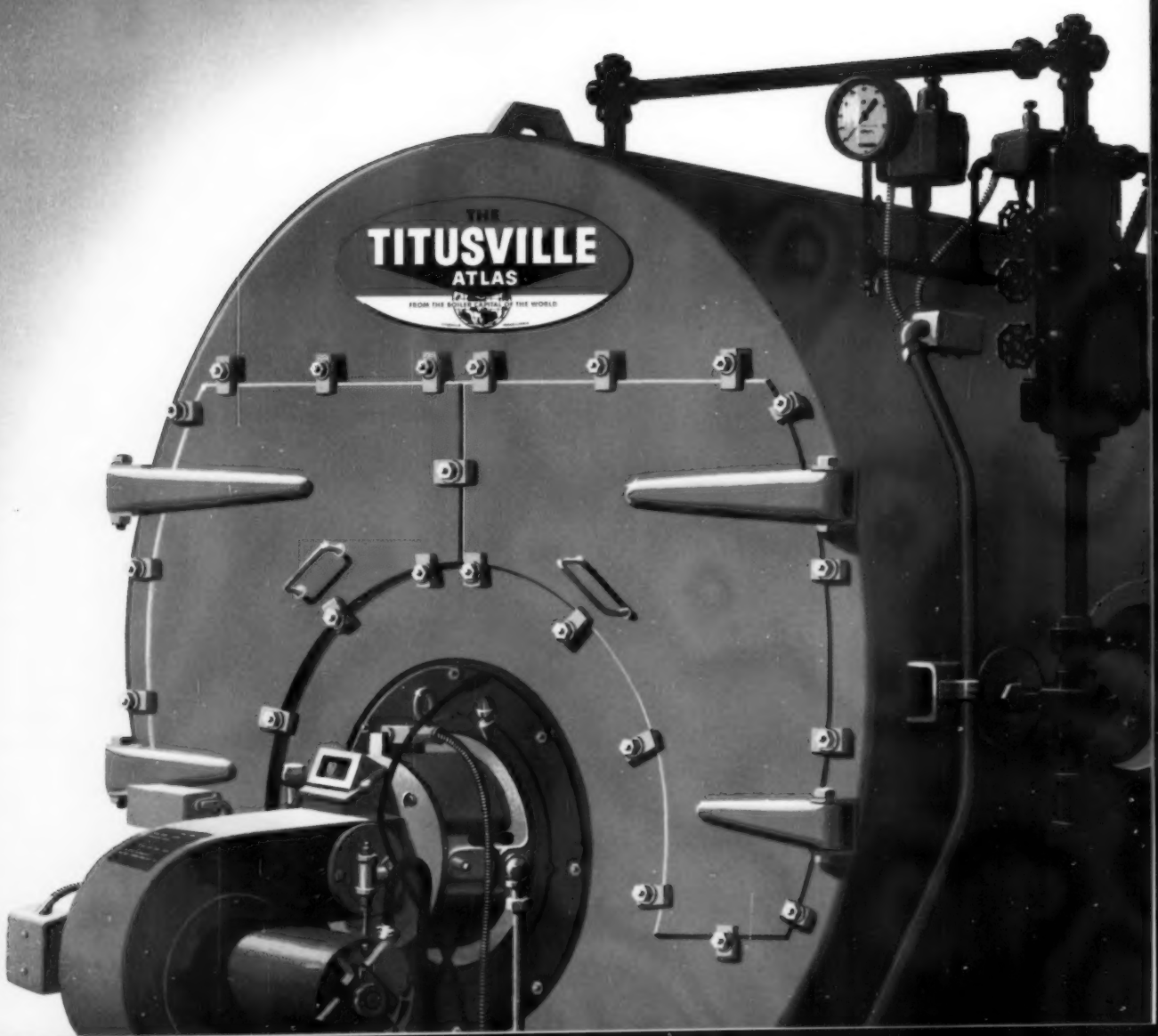
BONUS

from the Boiler



POWER

Capital of the World...

THE TITUSVILLE-ATLAS

BONUS POWER means maintained high efficiency . . . longer life . . . less maintenance . . . more horsepower per total energy input. That's what you get when you install a complete TITUSVILLE-ATLAS unit, the only boiler with a patented wet back.

Wet-back design gives you maintained efficiency by eliminating back end refractories. *Result:* no down time for replacement.

Larger furnace area permits reduced fan requirements. *Result:* lower operating costs. Get BONUS POWER. Specify TITUSVILLE-ATLAS.

THE TITUSVILLE IRON WORKS COMPANY

TITUSVILLE, PENNSYLVANIA

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VMA-6058

Custom engineering by Stromberg-Carlson

How engineered flexibility meets your specific communication needs with **standardized** components

"Custom engineering" by Stromberg-Carlson means a communication system that is ideally suited to your specific application—without the maintenance and service problems that can accompany custom-made equipment.

Each Stromberg-Carlson system is composed of **standardized** components—the basic building blocks—and is fashioned by customized application engineering to meet the requirements of your plant. This arrangement assures the greatest possible flexibility at the lowest possible cost.

What's more, you get the reliability, minimum maintenance and minimum service requirement inherent in using proven, standard components. And you have a built-in guarantee against obsolescence, because your system can be expanded or adapted to meet changing conditions—still with **standard Stromberg-Carlson components.**

The Stromberg-Carlson distributor, an expert Communications Consultant, will be happy to discuss with you the specific needs of your plant and help you decide how a communication system by Stromberg-Carlson can best meet them. Find him in the Yellow Pages under "Public Address & Sound Equipment," or write to Special Products Division, 1415-03 North Goodman Street, Rochester 3, New York.

"There is nothing finer than a Stromberg-Carlson"

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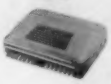
A DIVISION OF **GENERAL DYNAMICS CORPORATION**

Illustrated is a typical SS-800 "custom-engineered" paging or background music system, one of many possible customized arrangements of standard Stromberg-Carlson components.

A Dial-X® private telephone intercom system can either be "tied in" to the paging system or used independently.

Perhaps the needs of your plant can best be met by a Pagemaster® selective radio-paging system.

"Key - municator" loudspeaking intercom system is still another aid to more efficient operation.



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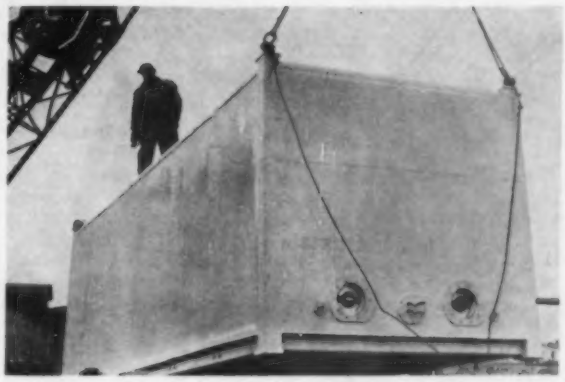
Spray Gun "Builds" 40,000-Lb Capacity Cargo Carrier

PRODUCT OF spray gun, and capable of transporting a 40,000-lb payload, a reinforced plastics cargo carrier has been built by Union Carbide Plastics Co.

Of epoxy-glass fiber construction, the container weighs 2800 lb. It is rigid and highly resistant to abrasion, fatigue, and chemical and salt water corrosion. Now being evaluated for handling bulk cargo, the carrier is one of the largest epoxy-reinforced plastic containers ever built; it measures 24 ft in length, 8 ft in width, 8 ft in height.

Component-wise, the prototype carrier consists of built-up epoxy-glass fiber panels, 4 ft by 8 ft, bonded to a steel frame. The plastic sections consist of a central corrugated sheet of epoxy-glass fiber, together with a flat skin of the same material bonded to both sides for strength, rigidity and smoothness. The corrugated sheet is .08 in. thick and the flat skin 0.1 in. thick. The entire panel assembly is about 2 in. thick and weighs 64 lb.

Core for the corrugated wall and ceiling sheet is heavy cardboard. The floor panels are built up on an aluminum core, and can carry a floor loading of 250 lb per sq ft.



After the panels were bonded to the steel frame, a curved sheet metal molding was bonded at all right angles in the interior of the carrier, to provide smooth surfaces.

Aluminum Pipeline Supplies Natural Gas to Chemical Plant

AN ALUMINUM natural gas line has been installed at a plant in Baton Rouge, La., using over 1600 ft of seamless pipe ranging in diameter from 4 to 14 in.

The aboveground line, serving an alumina plant operated by Kaiser Aluminum & Chemical Corporation, is designed to deliver 50 million cubic feet of gas daily.

Tungsten-inert-gas (TIG) and metal-inert-gas (MIG) welding methods were used in fabricating the line to take advantage of the greater speed of the MIG process in readily accessible locations and the easier handling of TIG equipment in close quarters. All low and high pressure pipe used was extruded from aluminum alloy.

Standard weight I.P.S. seamless pipe is installed throughout the gas line. The 4 and 10-in. pipe is schedule 40 while the 12 and 14-in. sizes have a wall thickness of .375 in. Welding fittings and flanges, manufactured by Tube Turns, Louisville, Ky., are of forged aluminum.

To avoid galvanic corrosion where aluminum and steel meet at flanged connections, insulating kits are used consisting of a gasket, sleeves for all bolts and insulating washers at each end of the bolts.

Special Job, Special Shape – Globe-Top Filter Controls Radioactivity in Water

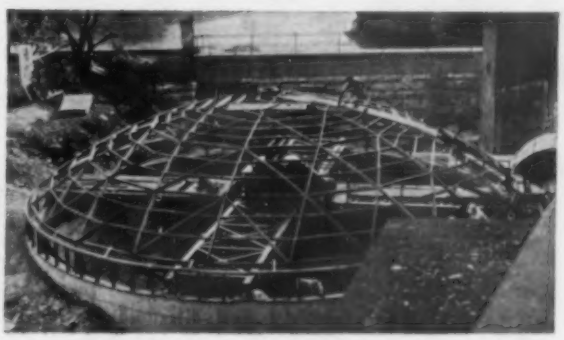
A SPECIAL FILTER tank has been installed by Knowlton Brothers, Watertown, N. Y., to remove radioactive contaminants from the company's process water.

Radioactive fallout from atomic and thermonuclear bomb tests can contaminate the river water to an extent that makes it unusable for manufacturing certain special papers used by manufacturers of light-sensitive photographic materials. The amount of radioactivity involved—in no way harmful to human beings—is far less than that emitted by the luminous dial of a wrist watch.

The necessity for removing this almost undetectable amount of radioactivity stems from the fact that the special papers used for packaging photographic materials are in prolonged contact with the photo sensitive materials—up to two years—and defects in the films can result from even the most minute amounts of radioactivity in the wrapping paper.

The new filter tank is located next to the river from which the process water is drawn. Fifty feet in diameter and fifteen feet deep, the tank holds 108,000 gal of water during the filtering process. Water flows continually through the tank as chemicals are added to it, to precipitate impurities (and radioactive particles) from the water.

Unique feature of the filter tank, installed flush with the surrounding ground, is its redwood framed roof. Built on the principle of the geodesic sphere, the globe-shaped structure has no interior supporting trusses or posts.



NEW PLANT CONSTRUCTION —advance information on location, costs

Batesville, Ark.—Seiberling Rubber Co., 345 15th St. N. W., Barberton, O., will build a plant here as part of its current expansion program. New plant will cost about $1.3 million and present plans call for construction of a 100,000-sq ft building.

Watson, Calif.—B. F. Goodrich Chemical Company, 2069 E. 9th St., Cleveland, Ohio, a subsidiary of B. F. Goodrich Company, is constructing a plant here for the production of vinyl resins and compounds. Plant is scheduled to be completed by the third quarter of this year.

Springdale, Conn.—Polymer Industries, Poplar Street, this city, and a subsidiary of Philip Morris, Inc., plans to construct a solvent mixing mill and a polymerization plant at company facilities here. Work on the new construction, to cost about $500,000, will begin at once for completion by the end of this year.

Grantville, Ga.—Flagg-Utica Corporation, 101 Mathews Ave., Utica, N. Y., plans modernization of the recently acquired Grantville mills. Program will cost approximately $1.5 million. Plant will be converted to production of high quality knitting yarns, using the Roberts high-draft spinning system to be installed by the Roberts Company, of Sanford, N. C. Some 1200 spindles will be added at a cost of nearly $250,000.

Chicago, Ill.—Admiral Corp., 3800 W. Cortland St., plans to spend more than $1 million to enlarge company's present 500,000-sq ft facility located at Harvard, Ill. Ground has already been broken for a 75,000-sq ft addition to company's television receiver plant which is scheduled to be completed by the summer of 1960. A second 75,000-sq ft addition is planned for completion in the spring of 1961.

Chicago, Ill.—Victor Adding Machine Co., 3900 N. Rockwell St., plans major expansion of company's facilities located here and will spend in excess of $1 million in improving the company's plant and home office building. The improvement plan calls for an addition of 7200 sq ft of new office space and complete renovation of the existing 110,000-sq ft plant. Work on the project is already under way and will be completed late this year.

Illiopolis, Ill.—Borden Chemical Company, 350 Madison Avenue, New York, N.Y., will construct a new polyvinyl chloride plant on large tract of land near here. Plant will cost an estimated $4 million and is expected to be completed and in operation by late 1961. Plant will produce a full line of polyvinyl chloride and copolymer products, including those for vinyl flooring and record industries, solution coatings and extrusion grades, and specialty resins. Late last year company completed a second expansion at its polyvinyl chloride production facilities at Leominster, Mass.

Gary, Ind.—United States Steel Corp., 525 William Penn Place, Pittsburgh, Pa., plans to construct a new rolling mill at company's steel works located here. New mill will replace a 160-in. plate mill that was installed at the Gary Works during World War I, and will be planned as a combination 160-in. and 210-in. plate mill with provisions for rolling and flattening steel at either width. New mill will be completed early in 1962 and will roll plates weighing as much as 60,000 lb.

Fairfield, Iowa—Rockwell Standard Corp., Coraopolis, Pa., plans to build a large plant for the manufacture of universal joints. Company expects to spend approximately $3 million in plant and equipment for the new facility which is scheduled to go into production by the fall of this year.

Louisville, Ky.—Enro Shirt Company, 1010 S. Preston St., a subsidiary of Wilson Brothers, 836 Merchandise Mart, Chicago, Ill., plans to construct new facility to be used as a plant and company headquarters here in Louisville, Ky. Plant to cost about $1.3 million will integrate Enro's manufacturing in one plant and increase capacity of the subsidiary by 30 per cent. Completion of the 137,000-sq ft building is scheduled for late summer of this year.

Midland, Mich.—Dow Chemical Co. plans to construct a plant for the production of phenol in the Pacific Northwest, at a location not yet selected. The plant which will have a capacity of 36 million pounds a year will cost several millions of dollars for property development and plant construction. Plant will be completed sometime early in 1961 and will go into production shortly thereafter.

Parlin, N. J.—E. I. du Pont de Nemours Company, DuPont Building, Wilmington, Del., plans to construct a plant here for the production of commercial quantities of a new plastic plate for engravings used in the printing industry. New plant will have an initial capacity of one million square feet of photosensitive plastic plates a year. Work on the facility will begin at once and is scheduled for operation by mid-1961.

Schenectady, N. Y.—General Electric Corp. plans to construct a large materials and processing laboratory for company's huge steam-turbine generator department located here. Groundbreaking ceremonies will be held in the near future when work will get under way. Plant to cost in excess of $3.5 million will be completed by the summer of 1961.

Cleveland, O.—Minerals & Chemical Corporation of America, Metuchen, N. J., has joined with Neville Lime Company, Pittsburgh, Pa., to form the Cuyahoga Lime Company of Ohio to make metallurgical grade lime for steel makers in the Cleveland area. The two companies will construct a plant in Cleveland to cost between $1 and $2 million.

Newark, O.—Reichhold Chemicals, Inc., 523 N. Broadway, White Plains, N. Y., plans to construct a chemical plant here for the production of 60 million pounds of phthalic anhydride annually. Company has also announced that it is spending about $2.5 million to enlarge capacity of its plant at Tuscaloosa, Ala., for increased production of phenol, used in wood and plastic products. Capacity of this plant will be increased from 60 to 90 million pounds a year.

Warren, O.—Bridgeport Brass Company, 32 Grand St., Bridgeport, Conn., has acquired a metalworking plant at this location which it will convert into an aluminum mill. Company has announced plans for the expenditure of $14 to $16 million over a five year period to improve the plant. Partial production will begin at the plant late this summer. Plant will have a production area of 366,000 sq ft.

Ponca City, Okla.—Continental Oil Company, Houston, Texas, plans to construct a $1-million petrochemical plant on large building site here. Plant will produce cyclohexane, a chemical used in the manufacture of nylon and solvents. Work on the new facility is already under way and is scheduled for completion by the fall of this year.

Glassport, Pa.—Copperweld Steel Company, 39 Teifeld St., plans major expansion of company facilities in various plants to cost in excess of $15.8 million. Plans call for the expenditure of $5.3 million at its Warren, O., plant; $2.4 million at its Superior Division plant in nearby Carnegie, Pa.; and $3.5 million for expansion and $2.5 million for new equipment at company's Glassport plant. Work on most of the projects is already under way and company will complete program in 1961.

Pittsburgh, Pa.—Jones & Laughlin Steel Company, 462 Gateway Center, plans to spend $9.5 million for the construction of a battery of 118 smokeless-type coke ovens at company works located here. Contracts for the construction have already been let to the Wilputte Coke Oven Division of Allied Chemical Corp., New York, N. Y.

(Continued on page 259)

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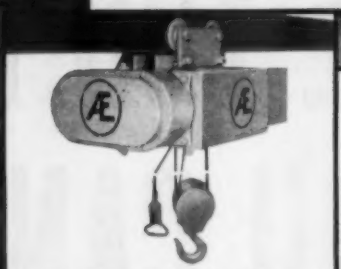

The AE Class BB-3, 3-ton standard heavy duty hoist with plain trolley

The AE L-¼, ¼-ton heavy duty hoist.

When other heavy duty hoists can't stand the gaff, here's one that will. It's our Class BB-3. Ask any user . . . look at the price, it's low . . . then compare it point by point.

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- Available in all suspensions . . . lug, plain, hand-geared and motor-driven trolleys.

The BB-3 is a standard 3-ton hoist that will stand up on the toughest jobs . . . in the critical spots where production flow must be maintained . . . regardless. It's priced to sell . . . less than many competitive hoists . . . and delivery is immediate from stock!

If you're looking at hoists, don't overlook our L-¼. It is the only truly heavy duty, ¼-ton hoist on the market. Compare its husky 195 lb to the usual 60- to 80-lb hoist, and be convinced! It costs a little more, but it's worth more. It will pay for itself many times over in maintenance savings alone.

For complete information and specifications refer to Sweet's Plant Engineering File 1a/Ae, or write for our new catalog 59.
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This is one of many of our Class BB-3 hoists that have been in continuous heavy duty service for over five years at one of the world's largest structural steel fabricators . . . The Drier Structural Steel Co. Yet the only replacement parts needed have been cables!

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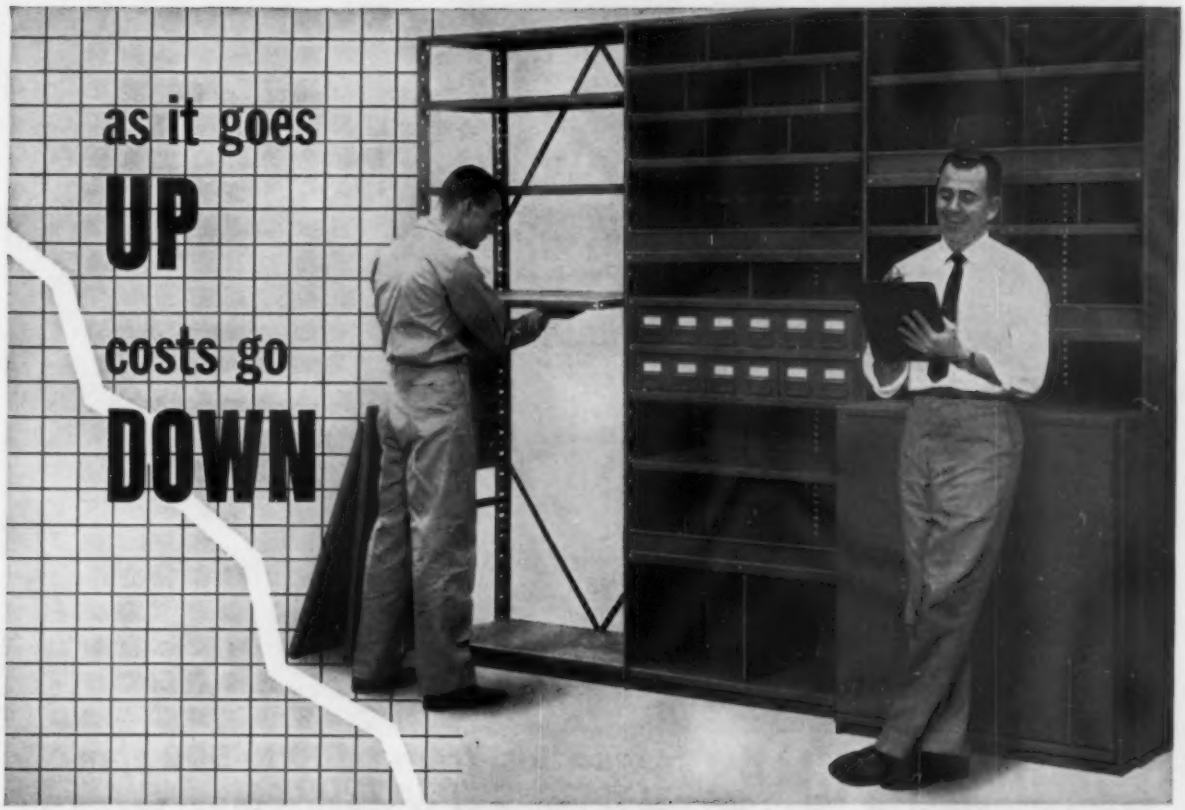

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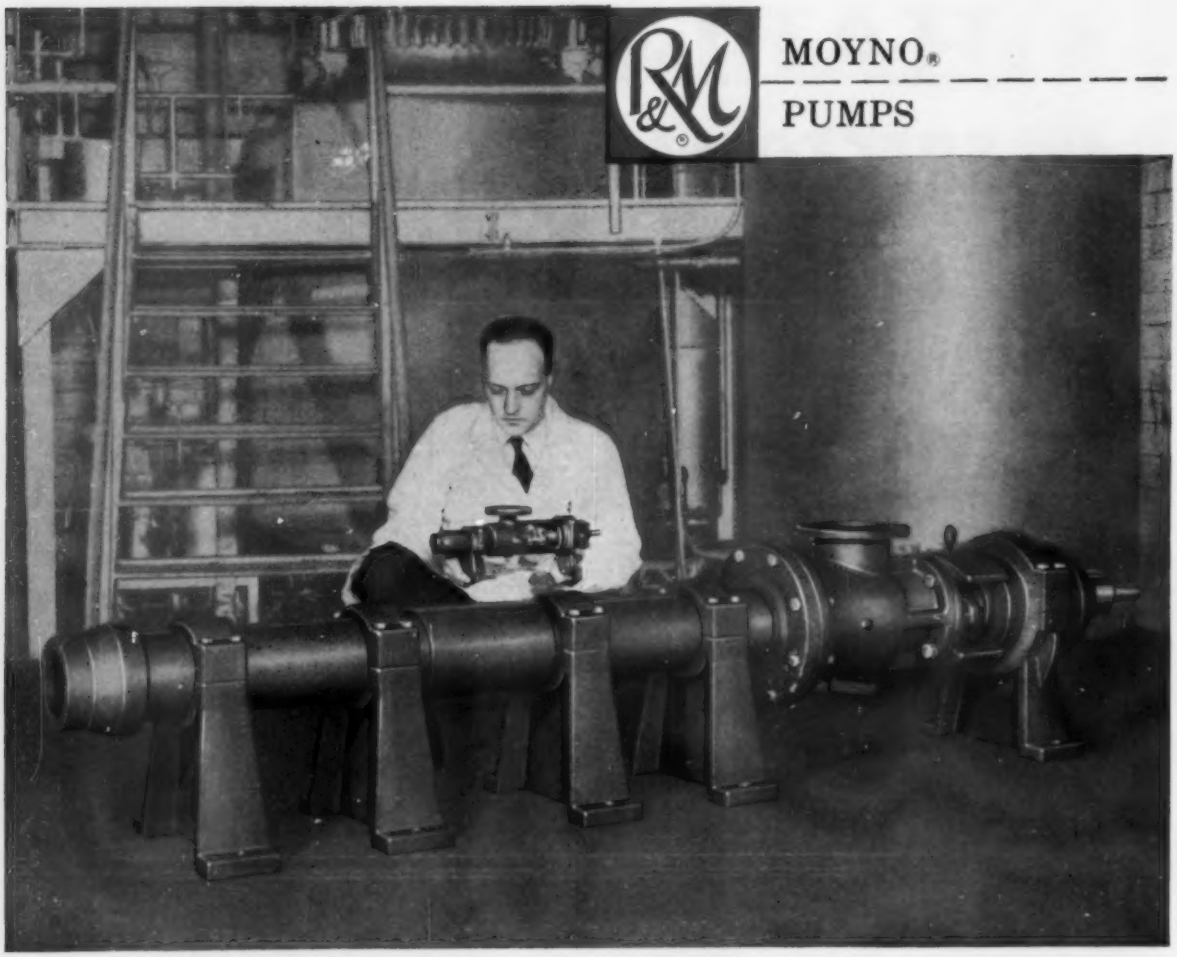

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MOYNO's unique *"progressing cavity"* principle with only one moving part and special resistant internal parts slashes pump maintenance costs on problem materials that often ruin other pumps. Almost any substance that can be forced through a pipe can be pumped by a MOYNO.

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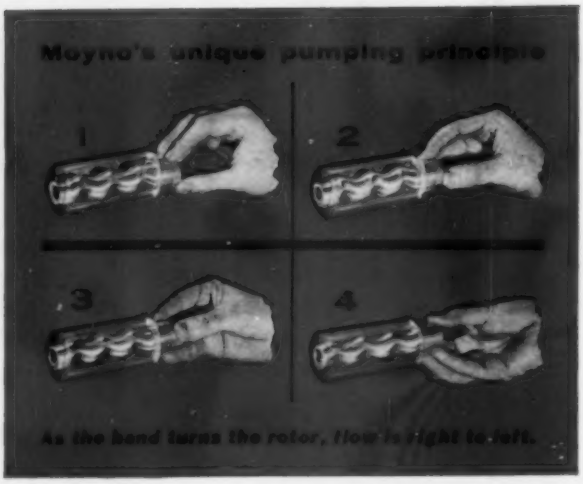

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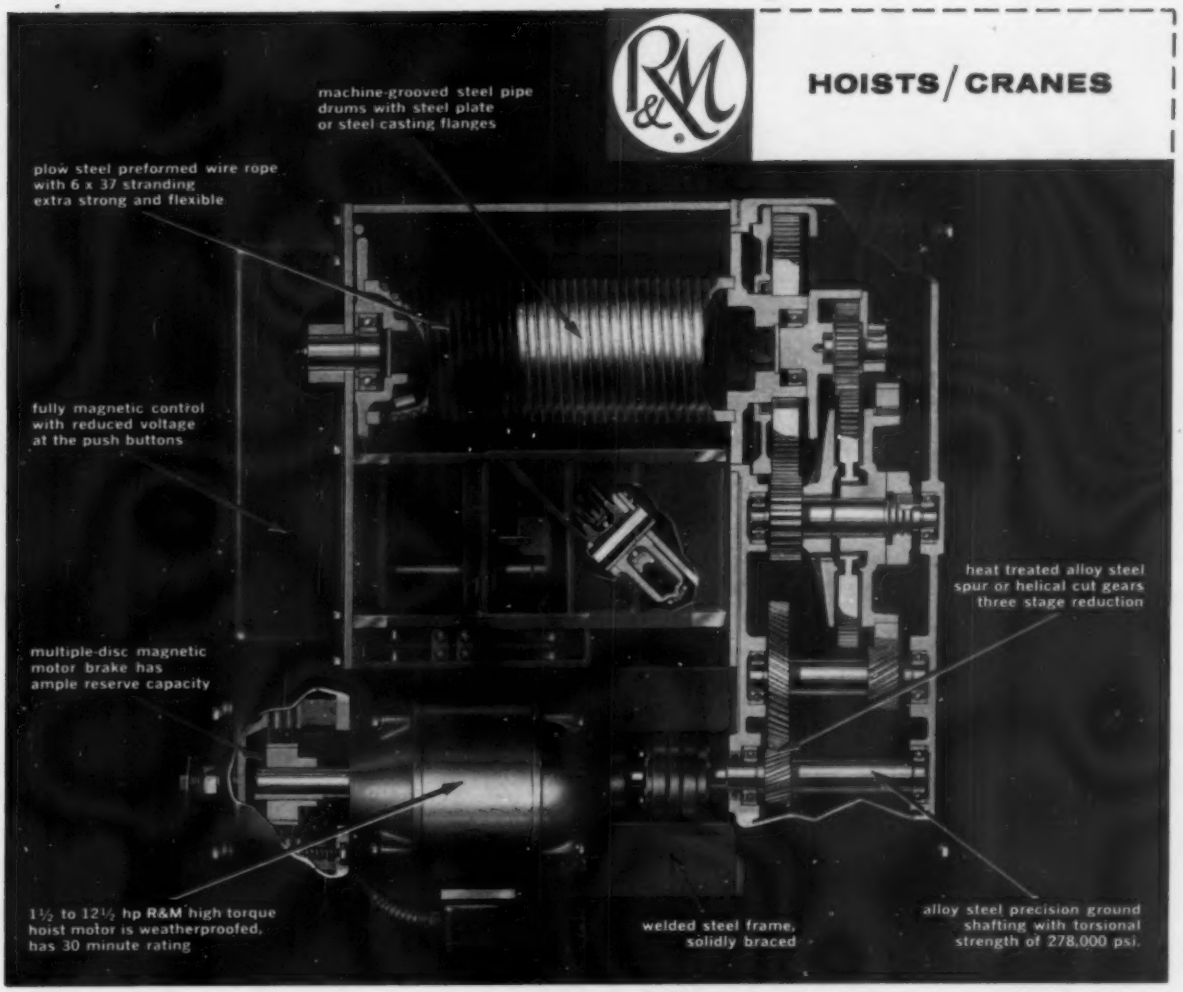
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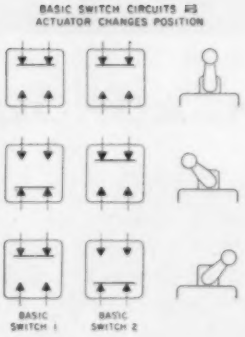
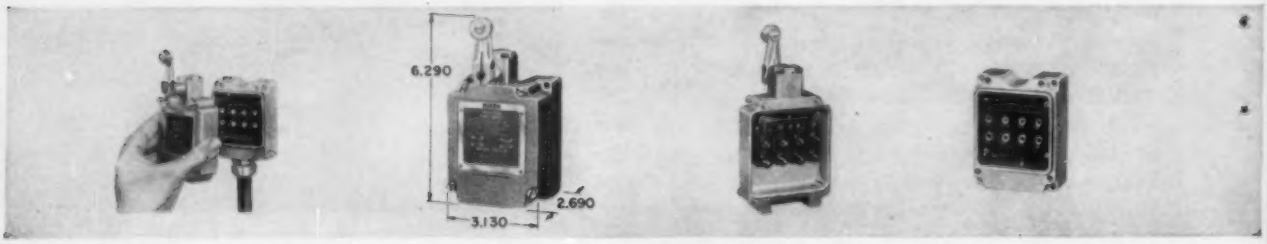
NEW center-neutral "Plug-in Limit" switch has 2 basic switches

Now you can control up to four isolated circuits in one limit switch. This new member of the MICRO SWITCH "Plug-in Limit" switch family actually performs the work of two double-break, snap-action limit switches, is designed for equipment that has parts moving in two directions.

The adjustable actuating arm operates one basic switch when moved to the left, another when moved to the right. Neither switch is operated in the center position.

Write for Data Sheet 168 on the versatile "Center-Neutral" limit switch or call the nearby MICRO SWITCH branch office or authorized distributor listed in the Yellow Pages.

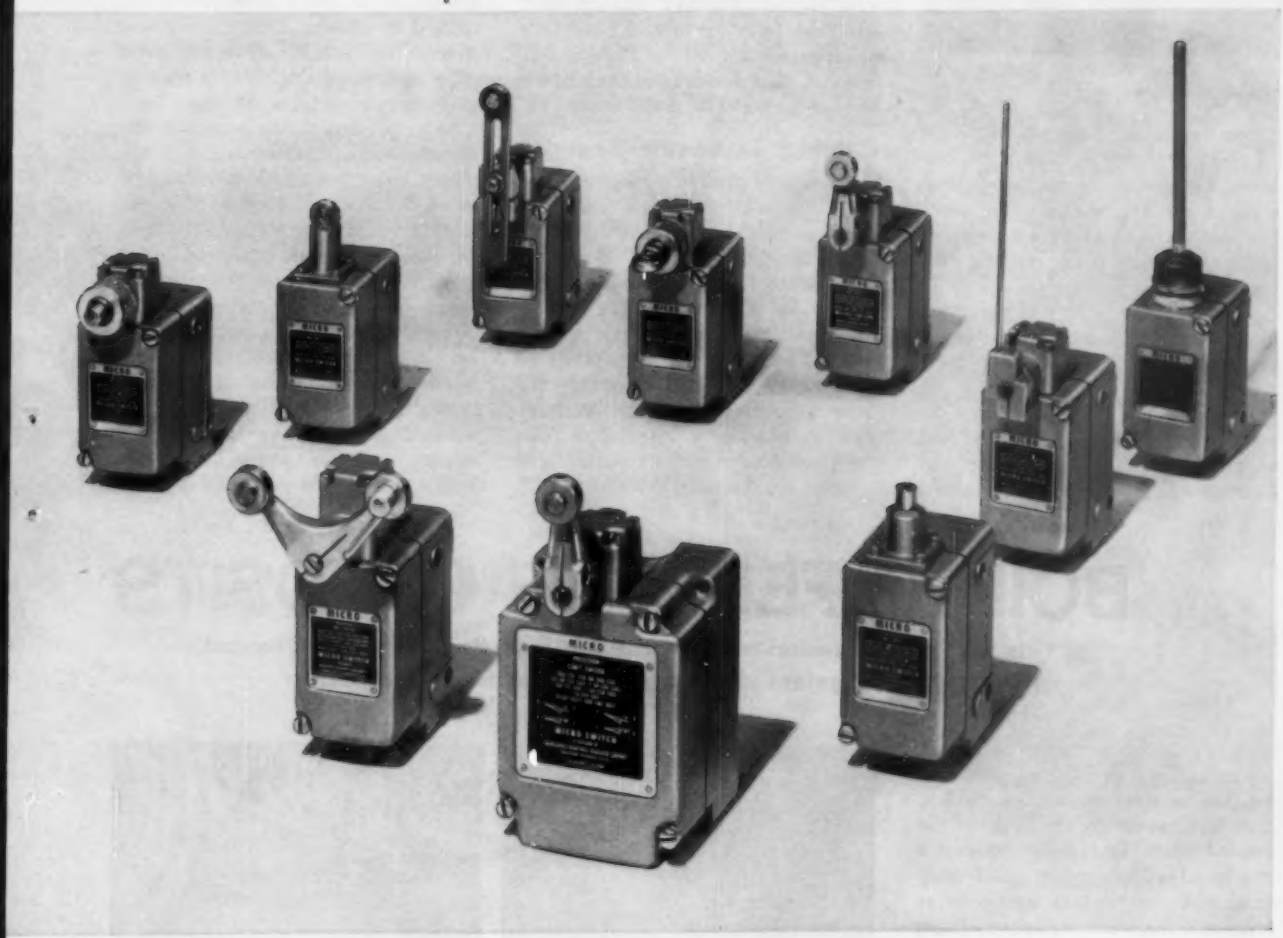




PLUG-IN DESIGN saves downtime because replacement takes less than a minute. It saves money because the receptacle remains in place and you do not have to replace the entire switch.

OILTIGHT SEALS on actuator shaft, between head and body, and on the receptacle rim, protect against oil splash or submersion. Operating head mounts in four positions.

H HONEYWELL MICRO SWITCH Precision Switches



MICRO SWITCH the most complete line of "Plug-in Limit" switches

NOW TEN DIFFERENT MODELS in the line of "Plug-in Limit" switches built by MICRO SWITCH give you the widest choice in the industry. The flexibility in mounting arrangements and the variety of actuating systems make it possible to fit these time-saving units into most limit switch applications.

"Plug-in Limit" switches can be replaced in seconds by simply plugging them into the terminal enclosure like a radio tube. Special seals give these switches the best possible protection from oil, water and dust.

Write or call the MICRO SWITCH branch office or authorized distributor for information on the "200LS" Series. Ask MICRO SWITCH engineers to help you apply these cost-saving "plug-ins" to your limit switch applications.

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HELPFUL WATER CONDITIONING DATA FROM BETZ

BOILER FEEDLINE DEPOSITS

This helpful discussion outlines the factors affecting deposit formation in the preboiler system and suggests corrective measures.

THE formation of deposits within the boiler feedline is always troublesome, and frequently can prove dangerous if deposits develop to the extent that they prevent an adequate supply of boiler feedwater from reaching the boilers. Serious damage can occur to boilers due to low water with the consequent warping, blistering or failure of the tubes, and bulging of the tube sheets or shell.

Where feedline deposits have not developed to the point that they constitute a definite operating hazard, they may interfere with the heat transfer in closed heaters or economizers and cause considerable loss in thermal efficiency. Further, in order to overcome the friction loss caused by the deposits, increased boiler feed pump pressure is required. Feedline deposits usually interfere with the normal operation of automatic feedwater regulators causing abnormal changes in boiler water level, resulting in possible carryover of boiler water solids in the steam, or low water damage.

Hardness in the feedwater causes scale deposits to form on boiler heat exchange surfaces. In a similar fashion, hardness can also deposit scale in boiler feedwater lines. This problem is not unusual in boiler feedwater systems using the effluent from hot or cold lime soda or hot phosphate softeners. After-precipitation in the effluent from filters following the lime soda units, and less than top efficiency in filter operation after hot phosphate units, frequently result in feedline deposits. Serious corrosion in condensate return systems contributes to or may be entirely responsible for the same difficulty.

Calcium carbonate and calcium phosphate are the most common constituents of deposits in boiler feedlines. Iron oxides may also be present and occasionally under unusual conditions, deposits of calcium silicate, magnesium silicate and organic compounds of calcium and iron may contribute to the total deposit. Feedline deposits may also arise from mechanical conditions which permit silt, bits of cloth, gasket material, filter medium and other debris to enter the boiler feedwater system.

Calcium Carbonate Deposits

Deposition of calcium carbonate in the boiler feedline will result when the pH of saturation of calcium carbonate is exceeded.

The effluent from lime soda softener units, operating either in the hot or cold, is saturated with respect to calcium carbonate at the temperature of the softening operation. Since the solubility of calcium carbonate decreases with an increase in temperature, calcium carbonate will be precipitated from solution and deposited as scale in closed heaters and economizers when the feedwater temperature increases through these units.

The tendency for precipitation of calcium carbonate is reduced when the softened water, after filtration, is diluted with condensate. The condensate should be added to the softened water after filtration. If introduced prior to the filters, it will merely redissolve the suspended calcium carbonate and may not relieve the condition of calcium carbonate saturation in the filter effluent.

Raw water, high in hardness due primarily to soluble bicarbonates, frequently causes feedline deposits when used for boiler feedwater makeup. For every temperature, an equilibrium condition exists between the free carbon dioxide content of the water and the amount of calcium bicarbonate that can be held in solution. Even the slightest temperature increase may be enough to offset equilibrium and result in precipitation of calcium carbonate deposits.

Soda ash and caustic soda are frequently used to establish and maintain proper boiler water alkalinity and pH. When fed continuously to the boiler feedline, equilibrium is upset since both soda ash and caustic soda tend to increase the alkalinity and pH of the feedwater. Where a closed heater or an economizer is in use, the continuous feed of alkaline materials to the boiler feedlines will cause calcium carbonate deposits, except where the hardness of the feedwater is low as in the case of an effluent from a properly operated zeolite softener.

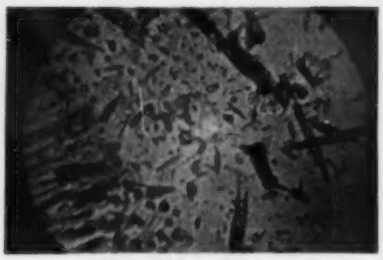

Figure 1—Calcium carbonate scale crystals at 450 magnifications

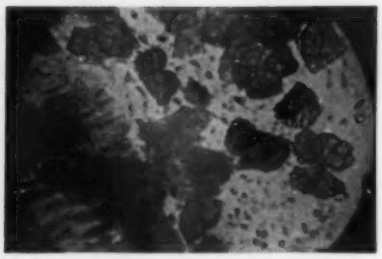

Figure 2—Distortion of crystals by feed of an organic surface active agent

Any method which will lower the pH of saturation will reduce the possibility of feedline deposits. Recarbonation, continuous controlled feed of acid, and use of inorganic and/or organic surface active agents are methods commonly used to control this problem.

The continuous and proportional feed of acid to a lime soda softened makeup water relieves the oversaturated condition with respect to calcium carbonate and will prevent deposition in the boiler feedwater systems. However, careful control of acid feed is required, and proper feeding equipment is necessary to avoid the obvious hazards of acid treatment.

A much less hazardous and more commonly used method for the prevention of feedline deposits is the use of surface active agents. Relatively small concentrations of surface active agents, usually not more than 10 ppm, will serve to retain calcium carbonate in solution even where an oversaturated condition exists.

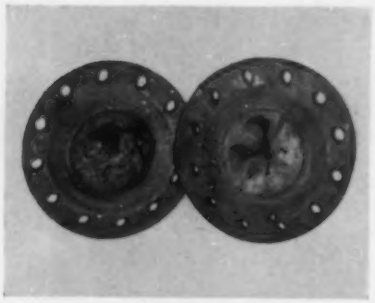

Figure 3—Sections of 8-inch diameter feedline showing calcium phosphate deposits

The use of surface active agents to prevent deposition is dependent on the power of the surface active agent to inhibit precipitation of calcium carbonate. The crystal distortion produced by organic agents is a large factor in retarding precipitation of calcium carbonate. Figure 1 shows, at 450 magnifications, calcium carbonate crystals formed at a heat transfer rate of 17,000 Btu per sq. ft. per hour. Figure 2 illustrates the distortion of the crystal formed under the same conditions in the presence of an organic surface active agent.

Calcium Phosphate Deposits

Deposits of calcium phosphate are frequently encountered in boiler feedwater lines. These deposits may result from several sources. Where the feedwater supply is the effluent from a hot phosphate softener, any increase in temperature after the softener will result in further precipitation of calcium phosphate in the feedline. Calcium phosphate also may be precipitated in the feedline where a phosphate base boiler water treatment is fed continuously, or in some cases even with shot feed through the boiler feedline.

When the phosphate so fed is in the ortho form, the probability of calcium phosphate deposit increases. Even with the use of a polyphosphate, some reversion may take place and deposits develop. Thus, depending upon calcium hardness, temperature and retention time, serious difficulties may arise when phosphates are fed through the boiler feedline. Introducing the phosphate only a few feet outside the boiler drum does not prevent deposition of an undesirable magnitude over a period of time. The speed of deposit formation is dependent on feedwater calcium hardness. If zeolite softening is used or if the makeup water is of a naturally low hardness, the speed of deposit formation is greatly reduced or prevented entirely.

The best method of introducing phosphate to the boiler water is by feeding continuously directly to the boiler drum employing a small chemical pump. If it is not possible to feed by this method, it becomes necessary to resort to shot feed or to feed intermittently to the boiler feedline. A by-pass shot feeder or a timer controlled high capacity chemical feed pump can be employed.

Iron Oxide Deposits

Iron oxides also contribute to or may be entirely responsible for feedline deposits. Iron present in well supplies used for boiler feedwater makeup will be precipitated by the increase in temperature that takes place in the deaerating feedwater heater. The increase in pH value of the feedwater as it passes through the heater (caused by the expulsion of the free carbon dioxide and breakdown of the bicarbonate alkalinity of the feedwater to produce carbonate alkalinity) will precipitate the iron from solution as finely divided ferric hydroxide. Intermittent boiler operation where the boilers are out of service overnight or over weekends causes a more rapid build-up of this precipitated material in the feedline. Iron may be present in the feedline deposits as a result of corrosion of the line at the point of deposit formation. The deposit may also be present as a result of corrosion in steam and return lines.

Iron may be removed from raw water by means of several different methods or combination of methods. Oxidation by aeration or chemical reaction followed by coagulation, sedimentation and filtration will produce an effluent water satisfactorily low in iron content. The external treatment of the raw makeup water to reduce hardness and alkalinity will also reduce the iron content. After-treatment of the steam to prevent carbon dioxide attack has been highly successful in reducing return line corrosion. Filming amines and neutralizing amines are most widely used as after-treatments in controlling this problem. Filming amines which function by establishing a nonwettable film on the metal surface in the condensate system, will protect the return system from both carbon dioxide and oxygen attack. Neutralizing amines react directly with carbon dioxide produced in the steam and are effective only against carbon dioxide attack.

CAN BE DANGEROUS

A review of the operating conditions at your plant is the first step toward prevention of deposit formation in feedlines, heaters, boilers, and steam and condensate systems. A BETZ Field Engineer will be happy to conduct a comprehensive survey and offer constructive recommendations, without obligation. Why not call him in *today?*

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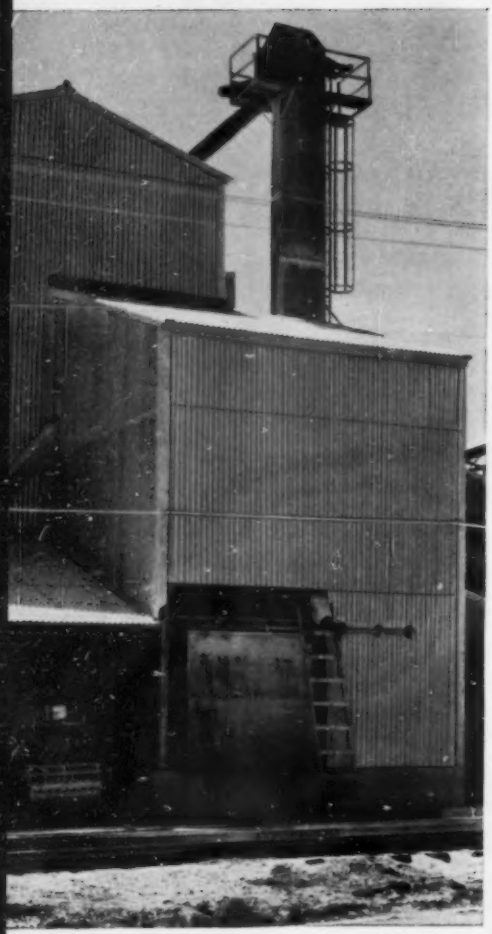

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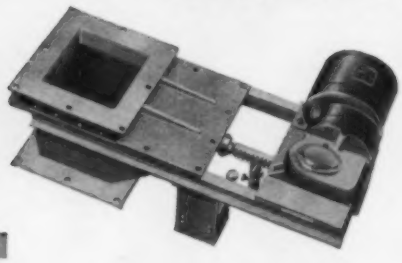

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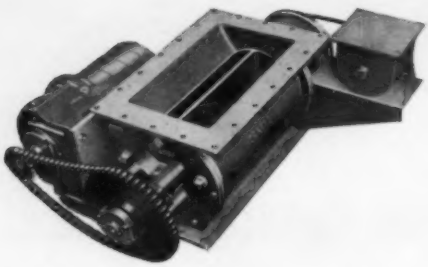
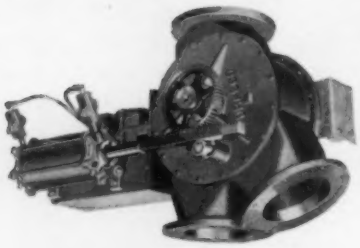
ROTARY FEEDERS:



Used for discharging or feeding non-abrasive materials at uniform predetermined rates. Models available for positive and negative pressure systems; both maintain pressure differential. Available with or without drive in rotor diameters from 5 to 28 ¼ inches, capacities to 10 cu. ft. per rev.

DIVERT

DIVERTER VALVES and GATES:



Precision-built for selection of flow path in pneumatic conveying lines or gravity discharge chutes. Tunnel-type for pelletized materials; flap-type for powdered materials. Available in manual, air or motor operated models. Accurate operation maintained throughout long life.

DRACCO *airstream* conveyors
dust control equipment

FULLER COMPANY GENERAL

For more facts circle 581 on Reply Card

ANOTHER **LYON** PRODUCT

VERSATILE
LOW COST

SLOTTED ANGLE

SO EASY TO USE

STORE IT?
STACK IT?
RACK IT?
CART IT?

❶ PROBLEM? ❷ PLAN ❸ CUT ❹ ASSEMBLE

Remember the erector set you enjoyed as a kid —all the different things you made—ladders, bridges, carts, windmills and dozens of others?

Lyon Slotted Angle brings you that same versatility and simplicity in slotted lengths of cold rolled steel angles—with heavy galvanized finish—ready to handle an endless list of man-sized jobs!

You don't need an engineering degree to use Slotted Angle. Just make a rough sketch, indicating the length of each part you need. Cutting angles to size is a breeze because there's a guide mark every 3 inches. A couple of wrenches is all you need for easy, on-the-site assembly.

Catalog #180 tells the complete story. Drop us a note and your copy will be on its way, pronto.

LYON METAL PRODUCTS, INC.

General Offices: 391 Monroe Ave., Aurora, Illinois
Factories in Aurora, Ill.—York, Pa.—Los Angeles
Dealers and Branches in All Principal Cities

Write for Slotted Angle Catalog #180. Or see your Lyon Dealer for delivery from stock of the world's most diversified line of steel equipment.

LYON
STEEL EQUIPMENT

A PARTIAL LIST OF LYON PRODUCTS

• Desks	• Storage Cabinets	• Bookcases	• Folding Chairs	• Softing Files	• Tool Stands	• Cabinet Benches	• Display Equipment
• Tables	• Flat Drawer Files	• Coat Racks	• Service Carts	• Hopper Bins	• Tool Boxes	• Revolving Bins	• Hanging Cabinets
• Stools	• Drawing Tables	• Shelving	• Work Benches	• Drawer Units	• Parts Cases	• Toolroom Equip.	• Slotted Angle
• Lockers	• Filing Cabinets	• Bin Units	• Bench Drawers	• Shop Boxes	• Bar Racks	• Service Counters	• Wood Working Benches

For more facts circle 582 on Reply Card

In Machining Tenite . . .

Production TRIPLED

MIGGINS SCREW PRODUCTS, INC., BREWSTER, N.Y.

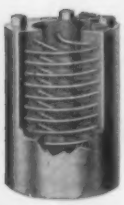
After Installation of a heat-x Coolant Cooler

The problem here was how to maintain *close* temperature control of the coolant. In machining Tenite, too low a temperature causes brittleness; too high a temperature permits softening, with resultant loss of precision and eventual fouling of tools. In addition, the close tolerances required (±.002 on the O.D.) demanded a high degree of machining stability.

The problem was solved by installing a Heat-X cast aluminum cooler with separate condensing unit. Complete packaged units are also available in a wide range of capacities. The coolant (water with a rust inhibiting agent added) is maintained at a constant temperature of 58°F. This accurate temperature control has permitted upping the production rate from 350 to 1100 pieces daily—*more than triple.*

In other operations (machining brass and aluminum, for example) tool life has been doubled as a result of close temperature control of the coolant—which in these cases is conventional cooling oil. Heavier feeds are also possible, hence a marked increase in production.

Whatever *your* cooling or heat transfer problem, check with your nearest Dunham-Bush sales engineer or write the factory direct.



Rugged Heat-X cooler has separate refrigerant and coolant circuits cast within a solid aluminum block.

Request Forms No. 1045, 8060 and 8061 containing complete information on Heat-X cast aluminum liquid coolers and cooler packages.

HEAT-X, Inc.

A Subsidiary of Dunham-Bush, Inc.

BREWSTER • NEW YORK

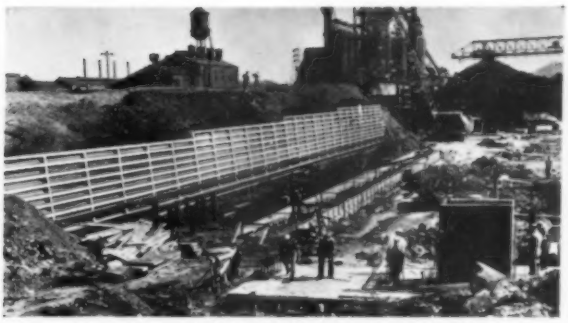
DUNHAM-BUSH

AIR CONDITIONING • REFRIGERATION • HEATING • HEAT TRANSFER

WEST HARTFORD, CONNECTICUT • MICHIGAN CITY, INDIANA
MARSHALLTOWN, IOWA • RIVERSIDE, CALIFORNIA
SUBSIDIARIES
heat-x HEAT-X, INC., BREWSTER, N.Y. DUNHAM-BUSH DUNHAM-BUSH (CANADA), LTD., TORONTO, CANADA
DUNHAM-BUSH DUNHAM-BUSH, LTD., PORTSMOUTH, ENGLAND DUNHAM-BUSH DRYDEN CORPORATION (CANADA) LTD., PORT HOPE, ONTARIO

For more facts circle 583 on Reply Card

Gain parking area

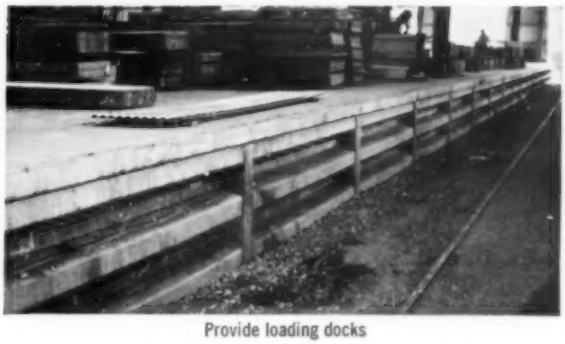


Hold back embankments

Combat stream erosion

Convert useless slopes to flat ground

Retain built-up ramps



Provide loading docks

Tough, Stable Armco Bin-Type Retaining Walls Can Help You Do All These Jobs

Armco Bin-Type Retaining Walls are a unique system of inter-connected steel bins, assembled at the job site from easy-to-handle units that speed work, keep costs minimized. You simply fill them with compacted earth. Simplified foundation requirements, plus the ability to resist soil movement and frost action, assure long, maintenance-free service. Send for complete data. Armco Drainage & Metal Products, Inc., 5510 Curtis Street, Middletown, Ohio.

New steels are born at Armco

Write for Armco Retaining Wall Catalog

ARMCO DRAINAGE & METAL PRODUCTS

Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company • The Armco International Corporation • Union Wire Rope Corporation

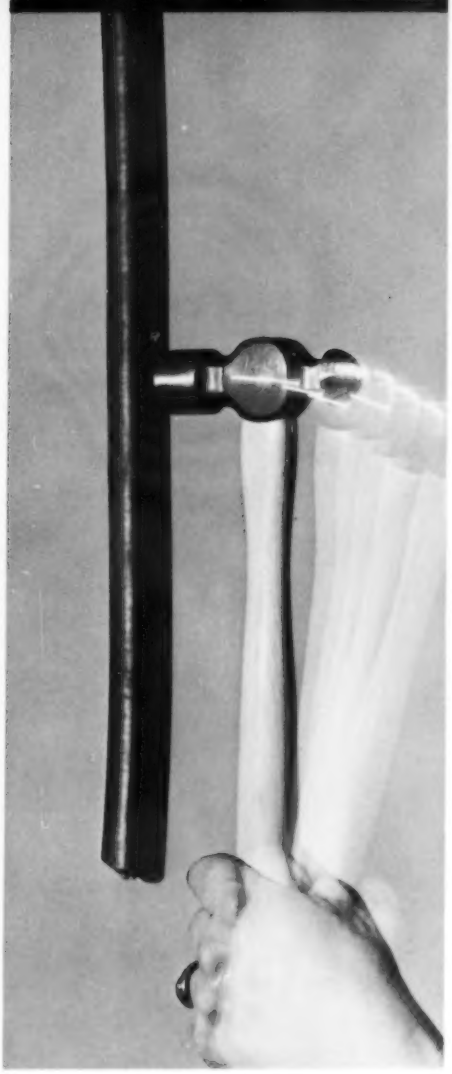
For more facts circle 584 on Reply Card

For more facts circle 585 on Reply Card →

Neoprene resists COLD FLOW

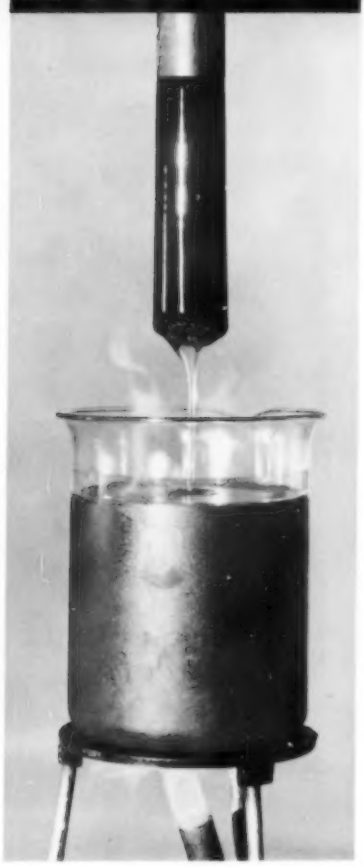
In laboratory tests and on the job, neoprene synthetic rubber has proved its ability to resist permanent deformation under load. It stays tough, resilient at high and low temperatures. Other cable jacketing materials get brittle when cold, soften when heated, flow when compressed. Not neoprene.

Neoprene resists IMPACT



Neoprene is a tough, resilient jacketing that can take impact and abuse. In the most severe mining service it has proved its ability to withstand abrasion . . . to resist gouging and tearing. It surpasses other cable jacketing materials in laboratory impact tests. It gives your cable the best protection available against abuse.

Neoprene resists HEAT . . . OIL



Neoprene jacketing resists exposure to oil, grease and a variety of chemicals and solvents. Its resistance to heat protects insulation at temperatures as high as 250° F. In addition, neoprene is flame resistant; it will not support combustion, an important factor among safety-conscious cable users in factories, refineries and mines.

Neoprene resists

SUNLIGHT...WEATHER

Installed January 6, 1935, these two test lengths of electrical cable have been exposed out of doors to rain, snow, sun, ozone and industrial fumes for over a quarter century. One jacketed with ordinary rubber (right) is badly cracked, furrowed, embrittled. But the neoprene jacket (left) is still sound, tough, resilient—still able to give complete protection to the cable.

Neoprene resists

SUB-ZERO COLD

In the arctic, neoprene synthetic rubber is used to protect radar domes—and you can use this cold weather durability in cable that must serve outdoors in frigid winter weather. Neoprene jacketing stays flexible and resilient at low temperatures ... successfully meets specifications for military cable designed for use at –65° F.

PROVED

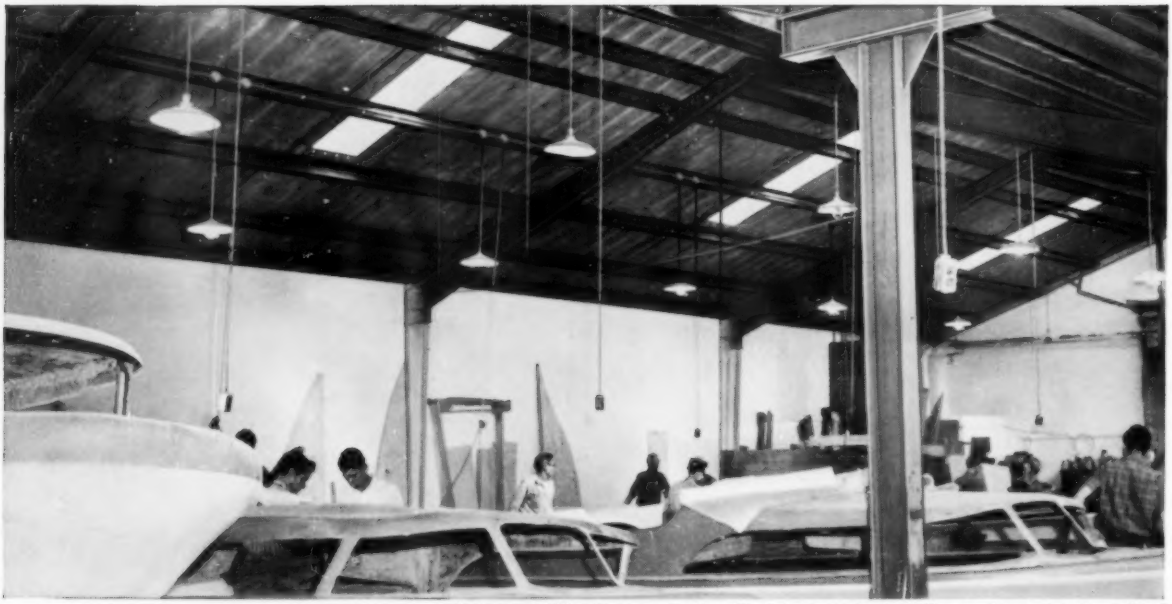
IN A QUARTER CENTURY OF INDUSTRIAL SERVICE —THERE'S NO DOUBT ABOUT NEOPRENE JACKETING

For more information, write to: E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. PE-3, Wilmington 98, Delaware.

DU PONT
REG. U. S. PAT. OFF.

NEOPRENE
SYNTHETIC RUBBER

Better Things for Better Living . . . *through Chemistry*



The Butler Building System gets Glass Magic boat production rolling again—in just seven days!

Over $100,000 in damage—but see how well basic Butler building withstands heat, fire.

New Butler components go up quickly. You save thousands of dollars in time and labor costs.

Imagine this! *Full production just 7 days after a $100,000 fire*

Just seven days after a blistering flash fire, the Glass Magic boat factory of Fort Worth had been *completely rebuilt* and was operating at *full production capacity!*

Sound impossible? With traditional forms of construction it would be. But Glass Magic has an alert management team . . . and pre-engineered Butler rigid-frame metal buildings.

Even though the fire was intense, the Butler metal roof sustained little damage, did not collapse or break through extensively. Pre-engineered, precision-fabricated Butler steel structurals were relatively unharmed. Basic building damage was kept to a very minimum.

Butler service specialists didn't waste a minute. Three days after the fire all necessary Butler replacement parts had arrived in Fort Worth. And the local Butler Builder gave Glass Magic top priority, had the building repaired by the end of the week.

Mr. H. J. Cain, Jr., Glass Magic vice president, knows that if conventional construction had been involved, it might have taken months—instead of days—to resume full production.

Says Mr. Cain: "We have always been proud of our Butler buildings, but it took a fire to make us really appreciate what we have."

BUTLER

BUTLER MANUFACTURING COMPANY

7529 East 13th Street, Kansas City 26, Missouri

Manufacturers of Metal Buildings • Equipment for Farming, Oil Transportation, Outdoor Advertising • Contract Manufacturing

Sales offices in Los Angeles and Richmond, Calif. • Houston, Tex. • Birmingham, Ala. • Kansas City, Mo. • Minneapolis, Minn. • Chicago, Ill. • Detroit, Mich. • Cleveland, Ohio • Pittsburgh, Pa. • New York City and Syracuse, N.Y. • Boston, Mass. • Washington, D.C. • Burlington, Ontario, Canada

For more facts circle 586 on Reply Card

This Natural Circulation KEYSTONE for Amalgamated Sugar Company, Nyssa, Oregon

Other Recent Users of Large Capacity Keystones

- **90,000 lbs./hr.**
  The Bay Petroleum Corporation
  Chalmette, Louisiana
- **80,000 lbs./hr.**
  Oregon Pulp and Paper Company
  Salem, Oregon
- **70,000 lbs./hr.**
  McDonnell Aircraft Corporation
  St. Louis, Missouri
- **60,000 lbs./hr.**
  Bethlehem Steel Corporation
  Sparrows Point, Maryland

The Keystone design was developed in the 1940's for engineers who demand top performance in water tube package steam generators. Unique features of this design make the Keystone the wise choice of engineers who specify and buy package boilers.

- **Symmetrical Design** — Easy to unload — easy to move.
- **Tangent Furnace Tubes** — No troublesome fins or studs required to form furnace or outer walls.
- **Tangent Outside Tubes** — Plus steel jacketed insulation for minimum heat loss.
- **Welded Inner Casing** — Eliminates casing corrosion problems.
- **Light Weight Insulation** — No heavy refractory tile to increase shipping weights.
- **Bolted Outer Casing** — No cutting or patching required when inspection is desirable.
- **Undivided Responsibility** — Firing equipment designed and manufactured by Erie City Iron Works.
- **Minimum of Maintenance** — No baffles — headers — key cap or handhole plates.

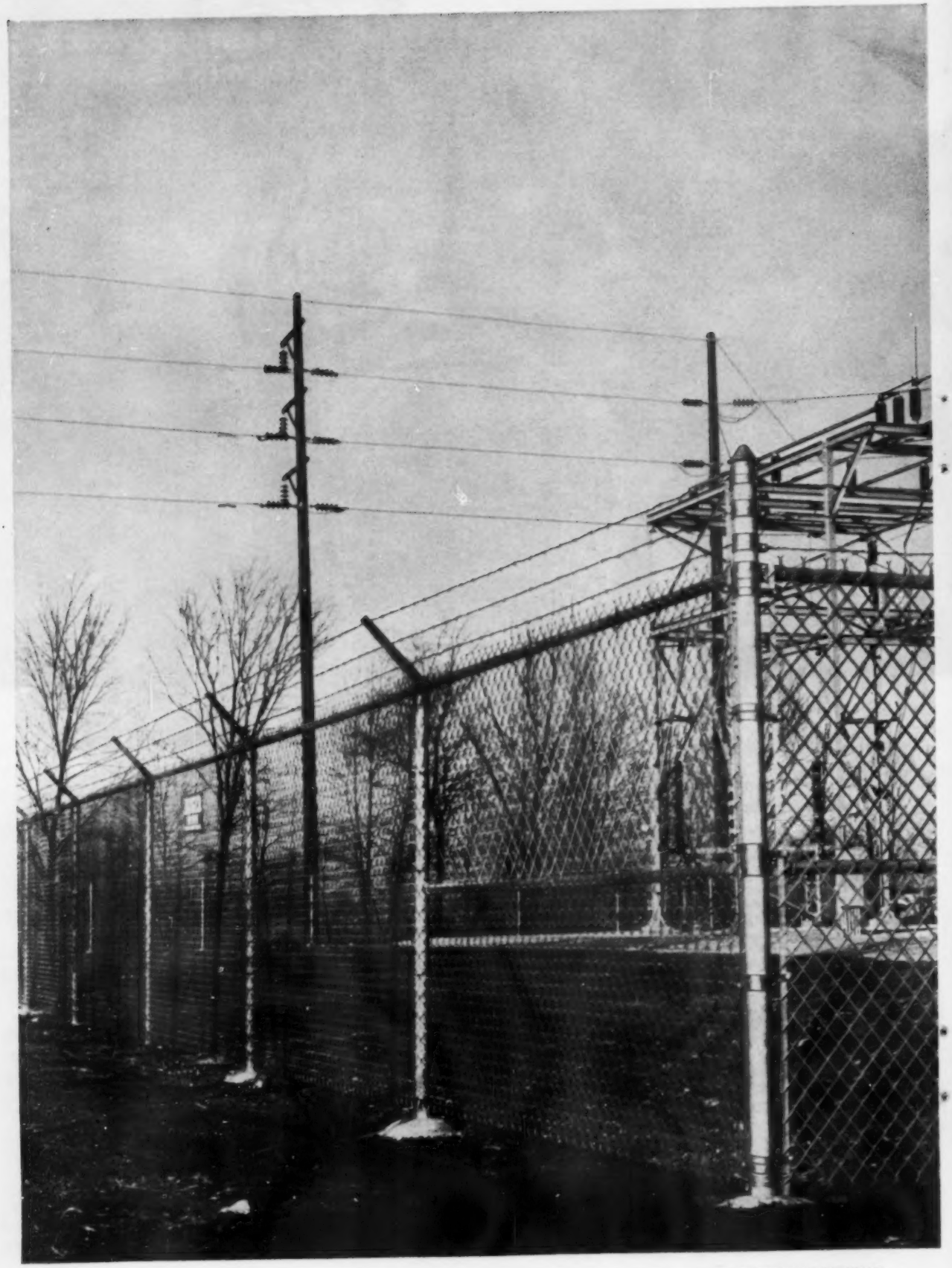
Keystones use only tubes for heating surface. No fins, studs or other extended surfaces of questionable value are used. The Keystone packs more real heating surface in the smallest space resulting in lower exit temperatures and highest efficiencies. *Get the details in Bulletin SB-5905-C.*

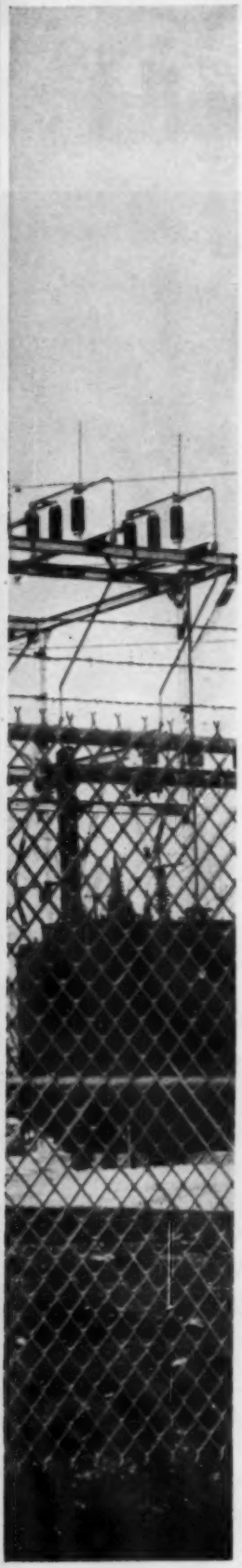
You can depend on ERIE CITY *Since 1840* *for sound engineering*

ERIE CITY IRON WORKS · Erie, Pa.

STEAM GENERATORS • SUPERHEATERS • ECONOMIZERS • AIR PREHEATERS • WASTE HEAT BOILERS
FIRE and WATER TUBE PACKAGE BOILERS • OIL and GAS BURNERS • STOKERS • PULVERIZERS

For more facts circle 587 on Reply Card





Cost comparison leads Dayton Power and Light Company to Alcoa Aluminum Chain Link Fence

Today's high costs for painting and other maintenance are causing progressive public utilities to re-examine the long-term cost of protecting their properties with chain link fence. A major Midwestern gas and electric utility, The Dayton Power and Light Company, of Dayton, Ohio, recently selected Alcoa® Aluminum Chain Link Fence for erection at two installations.

Alcoa engineers working with utility engineers approached the long-range evaluation in this manner:

OBJECT: To find a fencing material which will provide adequate protection at reasonable initial cost and will retain its strength, appearance and durability with minimum maintenance.

DATA:

Considerations	Galvanized Steel Chain Link Fence	Alcoa Aluminum Chain Link Fence
Height	7 ft	7 ft
Wire size	9 gage (0.148 in.)	9 gage (0.148 in.)
Appearance	Grayer than aluminum when new. Periodic maintenance necessary to retain original appearance.	Brighter and shinier than steel when new; protective oxide coating resists corrosion, retains silvery finish. Never needs painting.
Material cost per lineal foot (delivered price)	$2.25	$2.66
Painting cost* per lineal foot (at end of 10-year period)	1.35	—
Total cost after 10 years (per lin. ft)	3.60	3.38†
Total cost after 20 years (per lin. ft)	4.95 (min.)	4.10

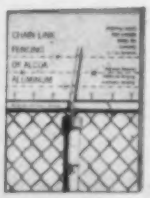
*Based on total cost of wire brushing, cleaning, prime coat and finish coat, the minimal amount of maintenance necessary to retain strength and appearance of steel, plus escalation at 3½ per cent per year (includes labor, transportation and material).
†Includes interest of 16 per cent on premium involved in initial investment.

CONCLUSIONS: Aluminum chain link fence retains strength and appearance without painting. Maintenance of steel fence offsets initial premium paid for aluminum.

RECOMMENDATION: It is suggested that aluminum chain link fence be specified for all new installations. Further, that replacement with same be considered before any existing steel fence is again painted.

The Dayton Power and Light Company had Alcoa Aluminum Fence erected before construction began in order to safeguard valuable equipment.

◀ **The Dayton Power and Light Company** chose Alcoa Aluminum Chain Link Fence for this new electric substation at Centerville near Dayton, Ohio. Aluminum Fence Company of Cleveland was the supplier.

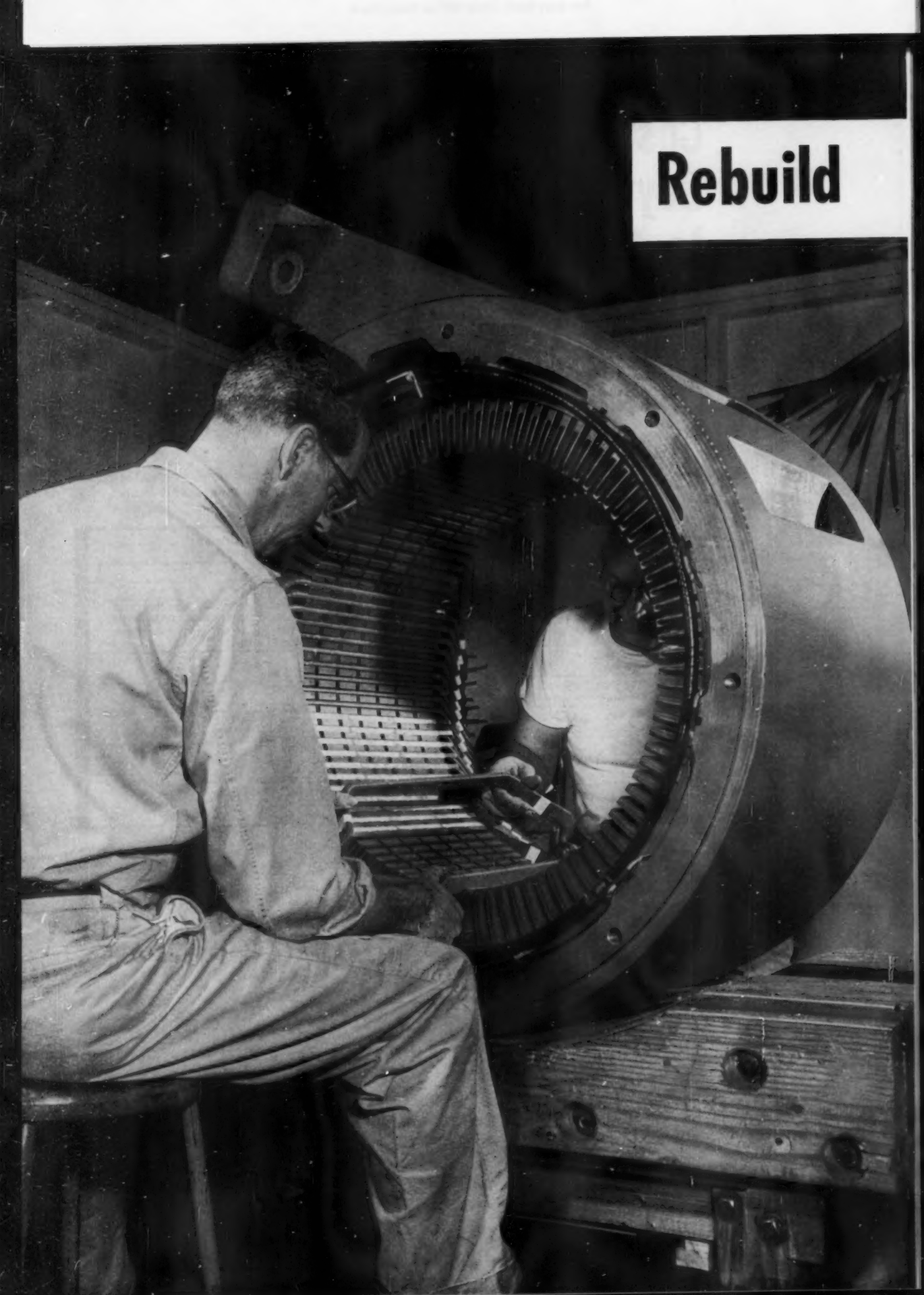


WRITE FOR FREE SUBSTATION FENCE SPECIFICATIONS: Alcoa's Standard Substation Specifications give all the details you need to evaluate and specify aluminum chain link fence for your own installations. Just write: Aluminum Company of America, 2057-C Alcoa Building, Pittsburgh 19, Pa. Or call the Alcoa sales office nearest you. You'll find it listed in the Yellow Pages of your telephone directory under "Aluminum."

ALCOA ALUMINUM

Your Guide to the Best in Aluminum Value

Rebuild



TO MAKE *Productive Maintenance* PAY OFF

long life into your equipment

WITH GENERAL ELECTRIC RENEWAL PARTS

POLYSEAL insulated coils are a typical example of a General Electric renewal part that gives better performance than the part it replaces.

THE COILS of this General Electric motor wore out after years of continuous service. Will the replacement coils last as long? In this case, they will last even *longer*, because they are General Electric's recently developed Polyseal* insulated coils, which have better dielectric strength than previously used insulation systems.

This kind of full, dependable life is a requisite to any *Productive* Maintenance program. Planned, scheduled maintenance is based on the predictable life of your equipment and parts. Without this predictability, scheduling is useless. That's why General Electric factory-built renewal parts are your best value.

IN PERFORMANCE General Electric renewal parts consistently give original equipment value. More often, their performance is even better than the original's, because they incorporate more recent improvements in design, materials, and manufacture. Examples of such improvements are the Polyseal and Sealed Polyex insulated replacement coils . . . a new motor bearing system that seats more firmly . . . long-life contactor parts packaged in sets for fast, complete replacement . . . a new corrosion-resistant, non-sparking plastic motor fan.

There is a sound reason for this constantly improving quality. General Electric has a vital interest in the continuing performance of your G-E equipment, and the only way to assure this performance is to supply the very best products and parts. Why impair the continuing efficiency of General Electric equipment by using questionable parts?

Reduce the frequency of repair and unanticipated breakdowns by stocking and using only genuine General Electric renewal parts. For information, contact your G-E Apparatus Sales Engineer or G-E Distributor. General Electric Company, Schenectady 5, New York.

*Trademark of General Electric Co. 670-01

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 589 on Reply Card

BUELL-NORBLO
TWO GREAT NAMES
ONE GREAT LINE
OF DUST RECOVERY EQUIPMENT

With the acquisition of The Northern Blower Company, Buell can provide a broad range of products and systems for handling every industrial dust and air pollution problem. Norblo bag type collectors now augment Buell Cyclones and other mechanical collectors, electric precipitators, combination systems and centrifugal and gravitational dust classifying systems. And like Buell, Norblo has been accepted and proved through years of experience in active, on-the-job service. Thus Buell is better able to meet both standard and special requirements in fields that include the electric utilities, steel, oil, cement, chemical, paper, and other process industries. Buell Engineering Company, Inc., 123 William Street, New York 38, New York. Northern Blower Division, 6404 Barberton Avenue, Cleveland, Ohio. (Subsidiary: Ambuco Limited, 2-5 Old Bond Street, London, England)

buell
NORBLO

For more facts circle 590 on Reply Card

For more facts circle 591 on Reply Card ⟶

This shop cuts costs by using STANICUT *Oil 137 BCS*

Machines seven metals, one plastic with this one cutting fluid

Shank Manufacturing Company, Chicago, cuts production costs three ways by using STANICUT Oil 137 BCS. (1) The 15 Warner & Swasey Lathes are never down for change of cutting fluid when the metal being worked is changed. There's no time lost with shutting down, cleaning up and changing oil. (2) There are no losses from the use of the wrong cutting fluid. (3) Floor space is used for productive machinery instead of being tied up as storage space for barrels of different cutting fluids.

Titanium, brass, alloy steel, aluminum and seven grades of Stainless plus Teflon plastic are all worked on the machines. Latest equipment, a reputation for good work, experienced operators and on-time delivery keep business coming to Shank. STANICUT Oil 137 BCS helps Shank hold down manufacturing costs.

Does cutting costs with a cutting fluid interest you? Let one of Standard Oil's experienced lubrication specialists show you how STANICUT Oil 137 BCS can do it. Call the Standard Oil office nearest you in any of the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

You expect more from **STANDARD** *and you get it!*

Frank Kruppe, Shank president (left) shows Hank Krueger of Standard Oil one of the pieces Shank Mfg. produces. Hank Krueger provides Shank plant with technical service on cutting fluids. Hank has the experience for this work. He's been doing it for six years. He has an engineering degree from Illinois Institute of Technology and has completed Standard's Sales Engineering School.

A beauty of a buy!
B D
Black & Decker
25
New High Styled Heavy-Duty
BLACK & DECKER VACUUM CLEANERS

Black & Decker Heavy Duty Vacuum Cleaners designed to suit your every need

Take the new No. 25 Heavy-Duty, for example. Here's *whisper-quiet* cleaning in a new concept of industrial vacuuming. The 25's swivel top permits cleaning a 15′ circle without moving the vacuum. And when the job's done just throw away the disposable bag! With power to spare the No. 25 is the most compact heavy-duty vacuum on the market.

Other models, ideal for general office, factory and furnace room use, are the No. 35 (⅞ bushel capacity); No. 65 for wet and dry cleaning; No. 95 for extra capacity and power. No. 55 for super capacity (50 gallons); and No. 648, designed for efficient furnace cleaning.

Whatever your cleaning needs call on B&D power, capacity, quietness. See the line soon. Mail coupon for free demonstration.

Capacity plus Power
. . . No. 95

Super-Capacity Cleaning
. . . No. 55

50th YEAR

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker®

QUALITY ELECTRIC TOOLS

For more facts circle 592 on Reply Card

See Tools-Electric -Yellow Pages-for Service & Sales

THE BLACK & DECKER MFG. CO., Dept.
Towson 4, Maryland (In Canada: Brockville, Ont.)

☐ Please arrange a demonstration of _____
☐ Please send additional information on _____

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

☐ Drills

☐ Saws

☐ Scrugun®

☐ Belt Sanders

direct drive

. . . makes fume removal an inside job

Installed directly in ductwork, space-saving DeBothezat Bifurcator Fans provide efficient direct drive power for fume removal.

Damaging fumes are kept away from the motor by a housing of acid-resistant metal alloy or of steel protectively coated with PVC (plasticized polyvinyl chloride) and many other types of synthetic linings. Fan wheels in a complete size range can also be made with similar anti-corrosion protection.

Save Installation Dollars

Installing a DeBothezat Bifurcator Fan is about as quick and simple as putting in a section of ductwork. Direct drive eliminates recurring maintenance problems. From space-saving installation to long-term operating economy, DeBothezat Bifurcator Fans keep costs down all the way. For detailed specifications on Bifurcator Fans, contact a DeBothezat Sales Engineer or write direct. Address Dept. PE-360.

De Bothezat™ FANS

A DIVISION OF

American Machine and Metals, Inc.

EAST MOLINE, ILLINOIS

Easily installed as a part of duct . . . indoors or outdoors.

IN CANADA: Represented by DOUGLAS ENGINEERING CO. Ltd., Toronto—Montreal

For more facts circle 593 on Reply Card

Stack it up against ALL others...

YOU'LL TAKE DELUXE SHELVING

FEATURE	DELUXE	Type A	Type B	Type C	Type D
I-Beam Uprights	Yes	No	No	No	No
Reinforced Sheet Steel End Panel Construction	Yes	No	No	No	No
Box-Lid Type Shelves	Yes	No	No	No	Yes
Factory Embedded Shelf Reinforcing Returned on Ends	Yes	No	No	No	No
Shelf Adjustment	2" or 1"	1"	1" to 3"	1½"	1½"
Shelf Fastening	Brackets	8 Bolts Per Shelf	U Bars on Brackets	Studs & Keyhole Slots	Clips & Studs
Erection Time Per Section	Fastest	Slow	Medium	Medium	Fairly Good
Smooth, Rounded Edges to All Parts	Yes	No	No	No	No
Paint Appearance	Excellent	Poor	Fair	Fair	Good

Stack it up for strength—Deluxe steel shelving offers so much more than competitive makes: I-beam construction, wrap around end panels, box-lid shelves, factory embedded reinforcing bars.

Stack it up for erection time—Deluxe goes up so much faster than competitive makes. With bracket assembly, requiring only two bolting operations, you can put up a regular section in less than fifteen minutes!

Stack it up for appearance—Deluxe looks so much better than competitive makes: all component parts are finished with smooth, rounded edges; paint is electrostatically applied over Cote bonding.

Stack it up for cost—Despite all the extra quality features, the Deluxe delivered and installed price is lower than competitive makes.

Conclusion: You cannot buy better steel shelving than Deluxe!

Factory representatives and dealers in all principal cities. For further details, call your local Deluxe man or write for Catalog #284, Deluxe Metal Products Co., Warren, Pa.

Royal METAL MANUFACTURING COMPANY

DELUXE METAL PRODUCTS CO. DIVISION
WARREN • PENNSYLVANIA

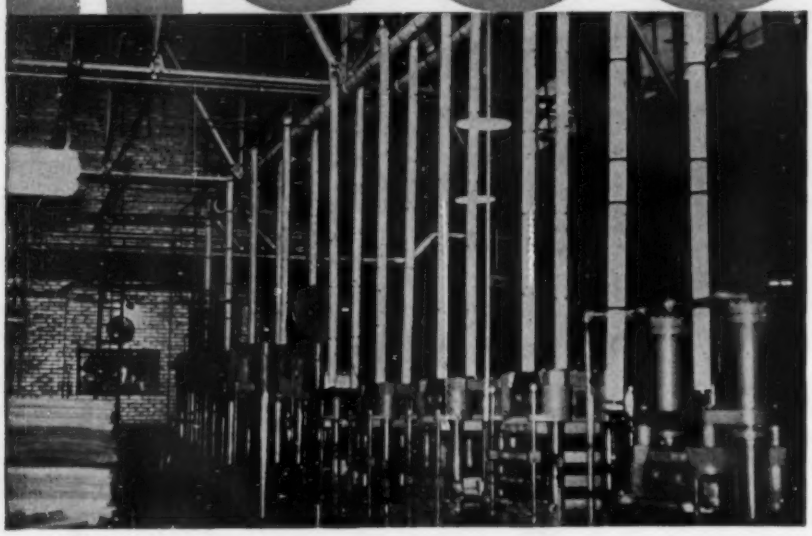
For more facts circle 594 on Reply Card

ROSS Air Systems

Engineered Atmospheres for Better Processing

ROSS SUPERTHERM

UNIFORM
LOW COST
HEAT FOR
PROCESSING
AND SPACE



Section of the Supertherm System serving the presses.

The First Installation in the U. S. (1936) Still Proves its Economy and Efficiency for Providing Process Heat

Synthane Corporation, of Oaks, Pa., producers and fabricators of Laminated Plastics for Industry, installed the Ross-Supertherm High Pressure Hot Water System for providing *uniform* heating . . . and *uniform* cooling . . to its presses and treating ovens. Cooling is included because the same medium serves for both heating and cooling.

Uniformity of heating and cooling is the key to consistently high end-product quality. Right from the start the Supertherm System provided this better than the previous steam system. It proved its economy after the change-over, too, because this system provided 26% greater efficiency than the good steam system previously in use.

The many users of the Supertherm System in the States and Canada get not only a more uniform heat at temperatures that can go to 400°F and beyond, but also a more economical heat. The process benefits and the economies are so attractive that anyone planning a new process or to use space requiring heat should investigate the Ross-Supertherm System. Likewise those who are dissatisfied with their present heating methods.

M-R

J. O. ROSS ENGINEERING

Division of Midland-Ross Corporation / 730 Third Ave., New York 17, New York

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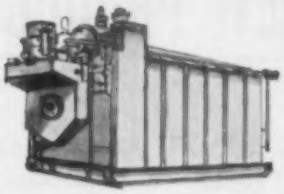
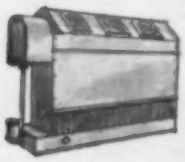
For more facts circle 719 on Reply Card

Now... new acid cleaners



Steam Boilers, Condensers, Heat Exchangers, Piping



Air Conditioning Cooling Towers, Ice-Making Machines, Evaporating Condensers

Food-Processing Vessels, Pipelines, Gelatin Evaporators

Marine Salt-Water Evaporators and Heat Exchangers

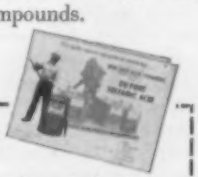
in **dry** easy-to-handle form

Cleaners based on Du Pont Sulfamic Acid are safer, more convenient, non-fuming... dissolve in water to form effective, low-corrosive solutions

Now... acid cleaners you handle *dry!* No fumes or hazardous liquid spillage to worry about. When mixed with water, these cleaners have all the penetrating power of hydrochloric acid with far less corrosive effect. The key to these unusual properties is a remarkable new ingredient — Du Pont Sulfamic Acid.

Sulfamic acid-based cleaners remove scale and deposits from air conditioning and ice-making equipment; food-processing vessels; steam boilers; milk evaporators and pasteurizers; marine evaporators and heat exchangers. Cleaning action is fast, thorough. Downtime is eliminated in many cases because cleaners are added while equipment is in operation.

We'll gladly send you additional information on sulfamic acid-based cleaners and the names of formulators who offer these new compounds. Just mail the coupon below.



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BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.)
Industrial & Biochemicals Dept., N-2533PE
Wilmington 98, Delaware

Please send me ☐ sulfamic acid general equipment cleaning bulletin; ☐ names of formulators offering cleaners based on sulfamic acid.

*Name*_____

*Company*_____

*Address*_____

*City*_____ *State*_____

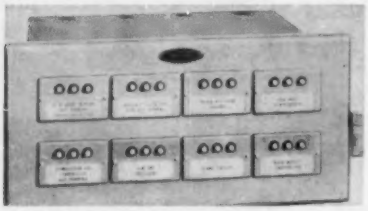
For more facts circle 595 on Reply card

NEW PRODUCTS AND PROCESSES summarized for your convenience

Edited by M. E. Heniken

1—ANNUNCIATOR identifies off-normals sequentially

Model 51-DS is a digital annunciator designed to instantly identify sequence in which a group of alarms occur. Any number of total alarm points can be handled. Three variations are available whereby up to seven, 15 or 31 off-normal points may be sequentially identified by clear binary readout, with resolution between points in milliseconds. For example, the sequential "7" variation consists of three lamps numbered "1" "2" and "4" above each alarm window, permitting readings from one to seven by summation. The Model 51-DS is reported especially valuable in monitoring complex processes where any one or more of many factors can cause automatic shutdown. Alarms are audible as well as sequentially visible. Panellit, Inc.



2—APPLICATOR EQUIPMENT for spraying the plastics

The Turbulator Spray Gun and Formulator Unit are designed to enable continuous, fast and efficient spray application of plastics, including polyesters, epoxies, gel-coats, foam-in-place materials and others. Manufacturer explains that plural component materials set up or harden quickly when the essential elements—activator, catalyst, and resin—are brought together, and such materials have had to be prepared in small quantities and used immediately. This new development is claimed to solve this problem by mixing the essential elements in a spray gun and spraying them immediately. Among uses to which these hard-to-apply materials can now be put include linings for storage tanks, coatings on structural steel and on building surfaces, also plastic foams for refrigeration or thermal insulation, sandwich structures, and cushioning.

The equipment is also said to overcome the lack of thorough mixing, inherent in plural component materials, due to the short reaction time of many materials. The roller-mounted formulator meters materials to the gun in required proportions. The spray gun serves to provide instantaneous mixing by forcing the elements

through high speed rollers driven by a built-in air motor—the mixture being discharged from the gun through a spray nozzle just a fraction of a second after mixing. Binks Mfg. Co.

3—FLUID forms coating to keep paint free of dust

Based on colloidal silica, this soil retardant concentrate is mixed one part with 14 parts of water to be sprayed, brushed, roller-coated, mopped or wiped on a clean interior or exterior painted surface as thinly as possible. Within 15 min. a hard, transparent coating has formed that sheds dust and dirt particles deposited from the atmosphere, company states, and smudges remove easily. Cost is reported to be a quarter of a cent per square foot.

In the watery solution of colloidal silica are hard spherical particles—smaller than the smallest of dust particles, it is explained. When the soil retardant is applied to a surface, these hard particles fill microscopic pits and ports where dirt particles could wedge themselves and resist removal. One thin coat only is required, and the thinner the film the better. Good results are reported on all vertical or sufficiently sloped areas where draining of excess fluid is permitted during drying. The soil retardant finish does not affect weathering of coatings, company says, and succeeding coats of paint can be applied. E. I duPont de Nemours & Co.

It's easy to obtain product data with the postage-free Reader Service Card provided on pages 271-272. Use them for information on advertising products, too. Just circle the key number appearing at bottom of the ad.

4—TRAILER compacts, carries industrial waste

Claimed the largest of its kind, this hydraulic compaction trailer compacts industrial plant waste, trash and refuse to a fraction of its former

volume. It is intended for plants generating huge quantities of waste or faced with long hauls to refuse disposal areas. There are two sizes. Model DB-42 is designed to pack in about 160 cu yd of loose refuse. It is 34 ft, 7 in. long and 10 ft, 8 in. high. Model DB-53 holds up to 210 cu yd and is 12 ft 6 in. high. Compacting operation is completely hydraulic. The packer head moves the complete length of the body (300 in.) for tighter packing and clean discharge. An 18-gal sump at the front end of the trailer gathers liquids when wet refuse is compacted. The trailer can be handled on any standard fifth wheel tractor or used with a tandem tractor. Dempster Bros.

5—SPACE HEATER operates on natural gas

Operating on natural gas at regular line pressure, this heater can be purchased with an additional conversion kit, so that it can be adjusted to run on high pressure LP gas. According to company, method of burner controlling allows heats from 200,000 to 240,000 Btu's to be produced by the blower unit. All controls, except thermostat, are self-contained. Manufacturer points out that blow outs and

NEW Westinghouse Industrial Fans Do All These Jobs Better

1. Remove metal dust, chips, sawdust, grains

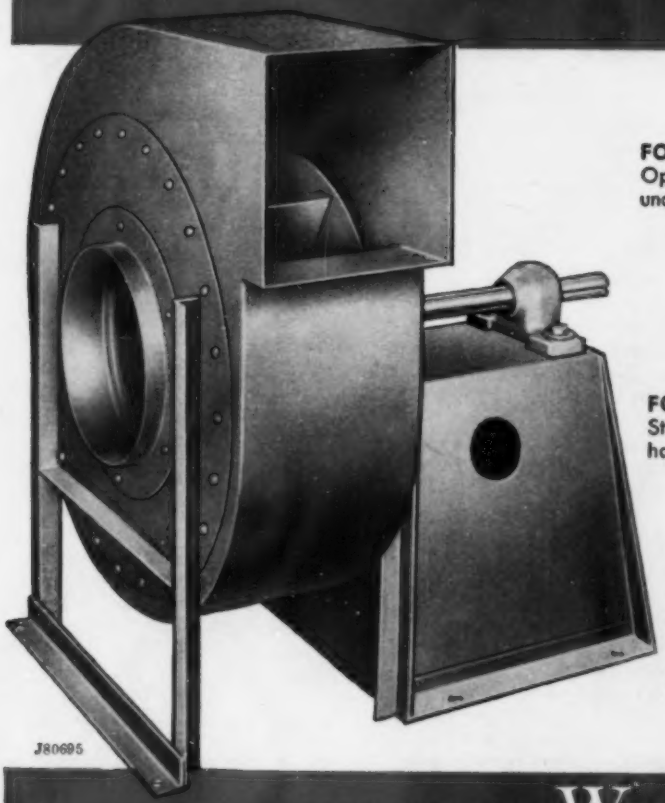
2. Convey long fibrous materials

3. Handle air, exhaust fumes, gases, smoke

Choose a Westinghouse fan, whether you are looking for performance, rugged construction, or prompt delivery.

For better value in an industrial fan, call your nearest Sturtevant Division Sales Engineer, or write Westinghouse Electric Corporation, Hyde Park, Boston 36, Massachusetts.

PLANTS AT HYDE PARK, MASS., LA SALLE, ILL., BERKELEY, CALIF.



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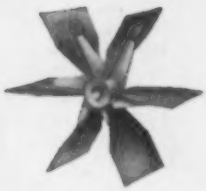


FOR MATERIAL HANDLING: Open radial blade wheel with unobstructed air passages.

FOR STRINGY MATERIALS: Strong backplate wheel easily handles fibrous materials.

FOR EXHAUST, CIRCULATION: Improved design with backwardly inclined blades for low horsepower.

YOU CAN BE SURE...IF IT'S Westinghouse

Watch "Westinghouse Late Show" Every Friday

For more facts circle 596 on Reply Card

NEW PRODUCTS

(Begins on page 196)

blow backs, which might happen under certain conditions, only result in automatic controls shutting off the unit. Aeroil Products.

6—MACHINE MOUNT for use with leveling screws

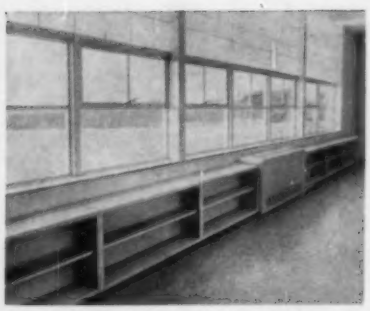
Model UL Unisorb Level-Rite Machine Mount is for use under machines with leveling screws built into the feet or at load bearing points. It combines Unisorb vibration control pads with a cast steel base plate, which has a recessed center to accept the

external leveling screw. The mount is said to eliminate need for anchor bolts, lag screws, grouting and shim plates; and the machine can be moved when required. The pad reduces transmitted vibration up to 85 per cent, says company, and protects the machine against induced vibration. The improved mount can be had in several sizes from 4⅝ in. square to 10⅝ in. square, with maximum loadings per unit up to 7500 lb. A super density type is also available for lathe mountings and long bed machinery with central drives. Unisorb Div., The Felters Co.

7—ARMORED CHAIN for high strength requirements

Designed to serve as a heavy-duty bundling chain, ACCO Armored Chain is suggested for any industrial application where high chain yield points are required and where crushing loads are encountered. Made from

low carbon steel, this high strength product is claimed non-kinking and non-crushing—excellent for slab and billet operations. It has the same working load limit as high carbon, high test chain, company says, and is unaffected by high temperatures. Continuous lengths or assemblies with master links at each end are available. American Chain & Cable Co., Inc.



8—STORAGE CABINETS conceal perimeter heating

Chromalox Draft Barrier Storage Cabinets provide storage space and, with company's electric baseboard mounted behind them, conceal perimeter heating. Cabinets and baseboard may be used as an independent room heater or with a unit ventilator to eliminate discomfort from downdrafts on long cold windows. If desired, baseboard may be installed first and cabinets added when needed. Cabinet base and top grille are perforated to allow air circulation to baseboard heaters. Cool air enters through the cabinet base, is heated and rises upward through the top grille—counteracting downdrafts. The cabinets are 16-gage steel finished in coral-tan enamel and have adjustable shelves. They come in 2-, 3- and 4-ft lengths, 26½ in. high, 13¼ in. deep, and may be joined together. Removable end panels and sliding doors are available for them. Edwin L. Wiegand Co.

9—MINERAL CLAY absorbs oil, grease, chemicals

Oil Spunj, is described as sanitary mineral clay, for absorbing oil, grease and chemicals, stopping skidding accidents, and smothering flash fires. It is processed in granular form. Spread on wool, metal, or concrete floors, ⅛-in. thick, it absorbs soluble oil, lubricating oil, grease, acids and chemicals. It stays on the floor until saturated, then can be swept off and re-used with soluble oil. According to the manufacturer, the mineral clay used plus the method of processing gives Oil Spunj its extreme bulk per weight, high soluble oil retention, and large floor coverage per pound. It is announced as UL approved. A free sample is offered. Canfield Oil Co.

10—FLUX for galvanizing, hot dip tinning

Wes-X 501 is a fluxing additive, for use in any aqueous flux bath that acts as an adhesive to keep the flux close to the base metal. Manufacturer says that it eliminates the critical time between fluxing and hot dipping and that parts have been flux dipped, allowed to dry, then hot dipped three weeks later. Westinghouse Electric Corp.

11—RUBBER ENCLOSURES for pendent push buttons

The 4000 Series of soft rubber, pendent-type push button enclosures is said to be oil-proof, moisture and oil tight, impervious to oil, grease and most chemicals, also shock absorbing, and vibration-free. A bright yellow color gives increased visibility. Enclosures are suggested for boring mills, trucking and loading, material handling equipment, and crane operations, and anywhere a workman has to move around his work with power control in hand. Daniel Woodhead Co.

12—ULTRASONIC CLEANER is economy priced unit

The diSONtegrator System Forty, a half-gallon capacity model, is announced as the lowest priced of ultransonic cleaners. It sells for around $100.00 and is claimed by manufacturer to compare in power, tank capacity, performance and appearance with cleaners priced many times higher. According to company, it will disintegrate more than 50 classes of soils and contaminants in seconds from a wide variety of products.

This cleaner includes a 40-w generator with output of 90,000 cycles per second. The cabinet has only one control knob—a simple push-pull activity regulation throttle. It is said to use no more current than an ordinary light bulb. The half-gallon capacity cleaning tank is heavy gage stainless steel with rounded corners. Operation is simple. The generator is plugged into a source of 117-v, 50/60 cycle current. Cleaning begins when the tank is filled with a suitable cleaning solution and the switch is flipped on. Ultrasonic Industries, Inc.

13—ELECTRONIC TRAP catches burglars unaware

Based on the capacitance principle, the Telapproach Burglar System operates when a burglar invades an electromagnetic field surrounding a safe. His body capacitance upsets the

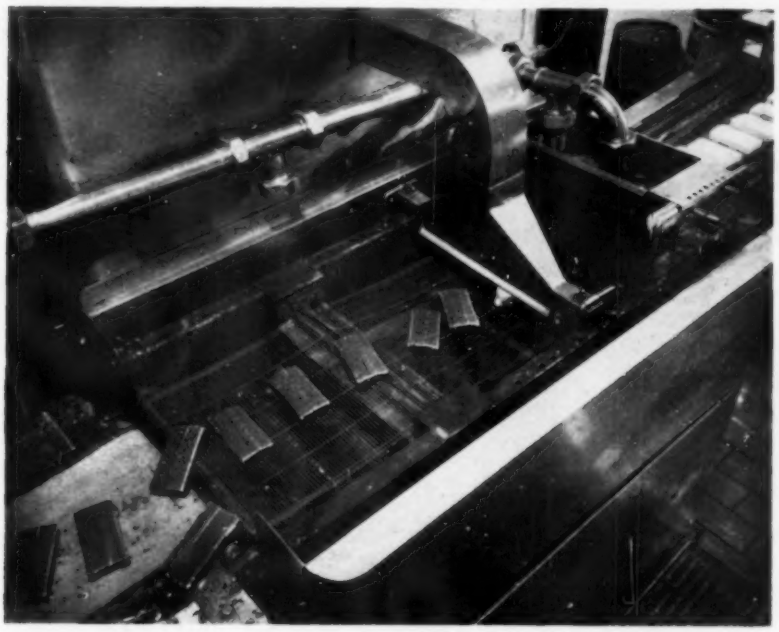
For more facts circle 597 on Reply Card →

first in silicones

Dow Corning

SILICONE NEWS

production and maintenance edition • No. 33



DURABLE, STICK-FREE CONVEYOR

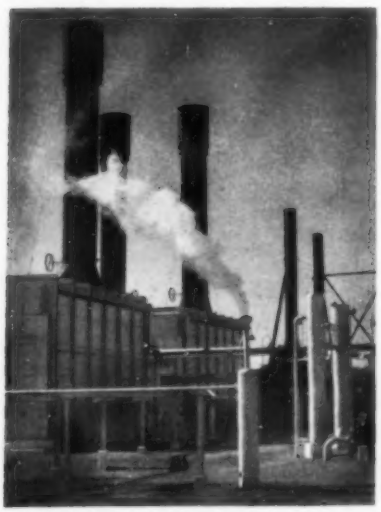
Ever wish for a materials handling belt that has a "release" surface? . . . one that can tolerate heat and cold? If so, here's a helpful hint.

The McDonald Ice Cream Company of Saginaw, Michigan, makes Eskimo Pies. After the ice cream is formed into blocks, a coating of hot chocolate is applied by the machine shown. Then, a conveyor belt (left) takes them through a re-cooling tunnel before packaging.

McDonald's found that conventional rubber belts offered two difficulties. (1) The chocolate stuck to them; necessitating the use of water to obtain release . . . an undesirable condition. (2) Belts failed rather rapidly due to the service environment. So McDonald's belt supplier, Hewitt-Robins of Buffalo, engineered a new belt of Silastic®, the Dow Corning stick-free silicone rubber. It works wonders.

Here's what McDonald gained. *Savings*: The belt of Silastic costs only 20% more, and lasts twice as long. *Savings*: Because the chocolate releases easily from Silastic, few bars need re-coating, and the syrup now goes 15% farther. *Savings*: Less labor goes into the operation, because it is no longer necessary to turn bars over to get adequate coating, no water is needed for release.

Summing up: Silastic proved a big help all around. If you have a similar problem, ask your rubber fabricator to engineer a part from Silastic. *No. 747*



KEEPS AWAY RUST AT 500 F

Any good paint will help keep rust from forming on metal surfaces. But what do you do when the paint burns off? Here's one good answer.

Stack temperatures on absorption oil heaters at the Snyder Gasoline Plant, operated by the Sunray Midcontinent Oil Company, run to approximately 500 F. To avoid the cost of repainting frequently — every time the conventional-type paint burned off — Sunray sought a more lasting finish.

They got it from the Cactus Paint Company of Big Spring, Texas. Based on a Dow Corning silicone resin, this paint is especially formulated for duty up to 500 F.

One of the stacks at Sunray was sprayed while hot, over two years ago. The others were sprayed later while cold. All are now in excellent condition, with no signs of rust in evidence. Before the silicone paint, nothing worked satisfactorily. Contrast this with the present record of over two years of operation without coating failure!

Whether applied to hot or cold surfaces, the Cactus paint forms a good, reliable coat to prevent corrosion, and easily outlasts conventional organic paints "at temperature". Do you have some piece of hot plant equipment that needs a lasting paint job like this? *No. 748*

End Bolt Binding

This Midwestern plastics company found a way to keep bolts on equipment from sticking. As a result it has reduced maintenance time and costs.

It was annual tear down time at the company. Workmen, in trying to loosen bolts exposed to high heat, often twisted the bolt heads off completely. The bolts had to be drilled out, delaying tear down time and adding to costs. *(Cont. Pg. 2)*

FOR DATA RELATING TO THESE ARTICLES, CIRCLE REFERENCE NUMBER IN COUPON ON NEXT PAGE OR REFERENCE NUMBER ON READER SERVICE CARD

MORE

A FASTER "SOFT-SHOE" STEP

The right release agent is often the "sole" difference between a modestly fast production line and a real "stepper". For instance . . .

The Genfoam Shoe Co. of Nashville, Tenn., a division of Genesco, Inc., makes canvas shoes. The rubber soles for these shoes are sponged and vulcanized onto the shoes in metal plate-type molds. Naturally, being so dependent on good appearance, shoes require the cleanest possible release from their molds. Until recently, an emulsion plus talc was the release agent used, and it worked fairly well but still left a lot to be desired.

Then the Genfoam Company tried Dow Corning 20 Compound. They adopted it *immediately*. Why? This silicone release agent doesn't cause the rubber to defoam during vulcanization as did the other release. Soles release more cleanly. The Dow Corning Compound needs to be applied only twice in a continuous 24 hour work day instead of after every cycle. The use of talc is minimized . . . and the molds don't require any cleaning between changes of sole colors.

The end result of all these advantages is a whopping 420 more pairs of shoes produced per day. But there's more.

Production's so much easier, so much smoother, so much cleaner, the Genfoam Company management feels that their happy employees "wouldn't work without it". Have you investigated Dow Corning release agents? . . . they might make this big a difference in your plant, too! *No. 750*

END BOLT BINDING *(Cont.)*

Enter: Dow Corning 41 Grease, a silicone lubricant.

Now plant maintenance men apply a light coating of this material to the bolts at annual tear down. Because silicones resist heat and won't gum up, the bolts can now be removed with ease. Even those located on the boiler clean-out flues and heat exchanger headers don't seize.

Since they started using Dow Corning 41 Grease, tear down time has been noticeably reduced, maintenance costs substantially lowered . . . the battle with sticking bolts won. *No. 749*

new literature and technical data on silicones

Better Brick Buildings—This is a 14-minute, full color documentary describing Silaneal, the only brick treating material proved safe in SCPRF-prescribed wall tests and by 3 years experience in the field. You can witness methods of application and actual buildings protected by invisible Silaneal that reduces ground stains, minimizes efflorescence, makes lay up easier and faster, and keeps walls clean and beautiful. longer. Arrange for a free showing by writing for *No. 751*

Handle The Stickiest Materials — Packaging materials coated with Syl-off peel away easily from adhesives, rosin, raw rubber or asphalt — even after long-term storage under adverse conditions. Production and handling costs can be cut, time saved, waste reduced and tempers subdued according to this 4-page, illustrated brochure. A list of Syl-off coated packaging distributors is included with . . . . . *No. 752*

Performance-Proved Dow Corning silicone lubricants can help you solve problems created by adverse operating conditions. Designed for reliable service over wide temperature spans, specialized Dow Corning silicone lubricants are used on equipment ranging from freezers to core oven conveyors — at temperatures as low as −100 F, as high as 500 F. Properties and applications for silicone oils and greases are compiled in an 8-page brochure. . . . . *No. 753*

How and why you can cut costs and reduce downtime with silicone-insulated electrical equipment available today is humorously and technically depicted in this easy-to-read 8-page reference. It tells what motors and transformers to select for what purpose to gain the unique advantages only silicone insulation provides. To learn of the savings possible in your plant, circle *No. 754*

You Can Foil Foam — Dow Corning defoamers kill foam that develops in the processing of chemicals, petroleum, asphalt, paper, textiles, food and drugs. A pamphlet indicates the minute amount of silicone defoamer required to gain added working space, decrease production time and trouble in metal working and each of the above processing industries. Investigate the savings made possible with defoamers. *No. 755*

Dow Corning Corporation, Dept. 9603, Midland, Michigan
Please send me: 747 748 749 750 751 752 753 754 755

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NEW PRODUCTS

(Begins on page 196)

system's delicate electrical balance, it is explained and, without arousing his suspicions, a silent alarm automatically results. Since the alarm does not require alternating current, failure of city power cannot cause an alarm or cripple the system, manufacturer points out. The system may be connected into existing protection circuits and its installation concealed. American District Telegraph Co.

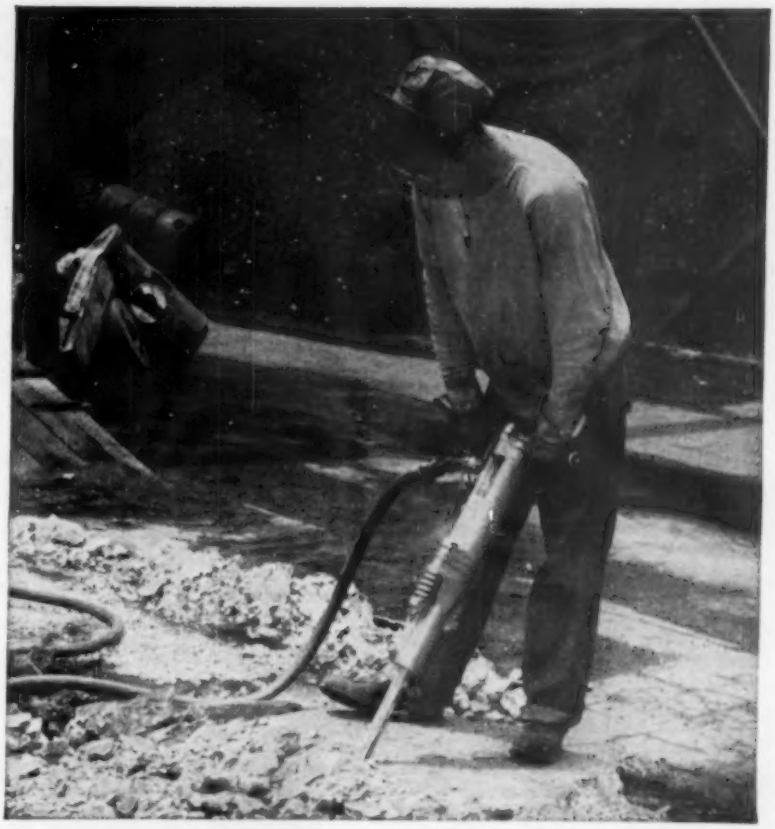
14—DUST COLLECTOR has some new design features

In the Dustex Roto-Jet, a cloth dust collector, centrifugal action is imparted to the dust upon entering the collector. This separates much of the dust before it reaches the cloth, and is a major reason for the high air

cloth ratio and reduced space requirements for the units. Other reasons are incorporated in a rotating blow tube and roller support system. According to manufacturer, this requires no reversing mechanisms or switches, operates with low torque, provides uniform cleaning time for each segment of the cloth, maintains a controlled wrap of cloth around the blow tube, provides an automatic cloth take-up, aids removal of particles from the fabric pores by a reverse bending action of the cloth, and prolongs cloth life. Three sizes are available: small, up to 1000 cfm; medium, to 1500 cfm; large, to 2000 cfm. These can be used in multiples to handle any volume desired. Dustex Corp.

15—LIQUID CLEANER does many cleaning jobs

Turco Plaudit is announced as a multi-purpose cleaning liquid compound for almost any industrial cleaning operation. According to company it has been used successfully for such operations as steam cleaning, emulsion cleaning, immersion cleaning, ultrasonic cleaning and wipe-on clean-



Speed maintenance via air... Gardner-Denver air and tools

Waste no time. Put Gardner-Denver air power and tools on your maintenance team. Fast-acting Gardner-Denver air tools help your crew make the most of maintenance hours. Impact wrenches • air hoists • paving breakers • trench diggers • sheeting drivers • backfill tampers • utility drills • grinders • ratchet wrenches • concrete vibrators • nut setters.

Compact Gardner-Denver rotary portable compressors provide a steady, dependable supply of low-cost air. Rugged drawbar makes Gardner-Denver rotaries easy to move. Jackleg provided for quick setting-up. Big toolbox for air hose and tool storage. Write for information.

Gardner-Denver RP85-G (85 cfm) rotary portable air compressor

Gardner-Denver RP125 (125 cfm) rotary portable air compressor

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

For more facts circle 598 on Reply Card

SARCO TOPICS

HOW TO PREVENT FREEZING OF HEATING COILS

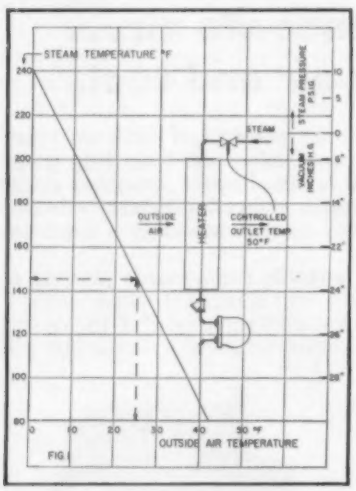
Despite the *best* "non-freeze" construction, air heating coils handling incoming air even slightly below 32° F are subject to freezing—*if they're not properly drained.*

Are traps to blame?

Under such conditions it is easily assumed that steam trap capacity is inadequate. However, there are other, more likely reasons. Since the discharge capacity of a steam trap depends upon the pressure differential between trap inlet and outlet, a zero pressure difference will result in zero capacity, no matter how large the valve seat is.

Why coils freeze

If the pressure at the trap inlet falls lower than pressure at the outlet, condensate cannot be discharged and will be held back in the coil. Condensate held in the coil is bound to freeze if the temperature of the air is below 32° F. As an example, consider a preheat coil designed to heat air from 0° F to 50° F, using steam at a maximum pressure of 10 psig. As the outside air temperature rises above 0°F, the heat demand decreases, the temperature *controller reduces the steam pressure* to compensate for this reduced heat demand—and the stage is set for coil freezing.



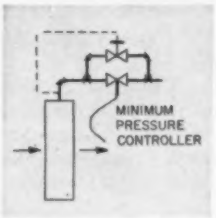
At left: chart shows how steam pressure in the heater is decreased by the modulating control as outside air temperature increases. Note that when outside air temperature reaches 7° F the pressure drops to 0 psig.

The remedy: 3 practical hook-ups

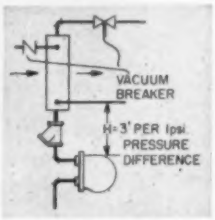
Starting with a correctly sized steam trap—*this is a must*—freezing can be cured by preventing the pressure differential across the trap from falling below the minimum needed to discharge all the condensate as rapidly as it forms. Here are three practical methods.

1. Arrange a pressure controlled bypass around the temperature control valve

This keeps the pressure in the heater from falling below a preset minimum. With this solution, however, the temperature controller is not effective over the full range of outside air temperature.



Schematic hookup for pressure controlled bypass around temperature control valve.



Hookup for installing steam trap below unit.

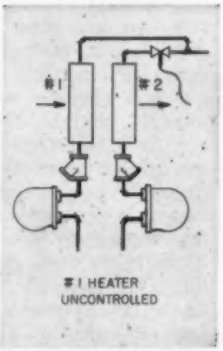
2. Install the steam trap well below the unit

This provides a hydraulic leg which allows the trap to discharge even with a vacuum in the steam space. A vacuum breaker should be installed at the top of the condensate header of the heater. To calculate the hydraulic head needed, use 3' per 1 psi pressure differential.

Example: if trap has required capacity at 1 psi differential, minimum head is 3'.

3. For a new installation, divide the preheater into two sections

The first section should be capable of raising the air to at least 32° F under minimum outside air conditions and the second to raise the air from 32°F to the final temperature. The first coil would be supplied with steam at full pressure at all times, while the second would be controlled to maintain the final temperature needed. The first coil could not freeze because of steadily maintained pressure, and the second would not freeze because the air temperature would be above 32° F.



Hookup for dividing preheater into two sections.

FIGURE IT OUT FOR YOURSELF — FAST! USE THE FREEZING DANGER POINT KIT. It's absolutely free. This *Master Graph* enables you to check, at a glance, the danger point in handling outside air. Complete with Technical Bulletin on preventing heating coil freezing, and Bulletin on Float Thermostatic Steam Traps. Write for Sarco Kit Z or ask your Sarco sales representative.

2171

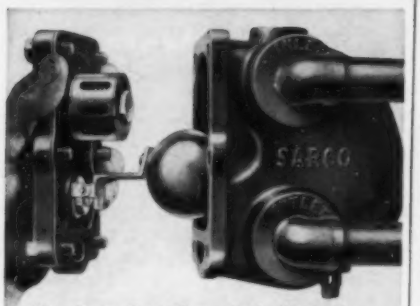
SARCO

SARCO COMPANY, INC.
635 MADISON AVENUE, NEW YORK 22, N.Y.
PLANT: BETHLEHEM, PA.

STEAM TRAPS • TEMPERATURE CONTROLLERS • STRAINERS • HEATING SPECIALTIES

For more facts circle 599 on Reply Card

SARCO



The Sarco Float Thermostatic Steam Trap cannot air bind, because its high-capacity air vent automatically discharges all air as rapidly as it reaches the trap. Requires no adjustment when pressures change. Available for steam pressures to 200 psi.

FOR CONTINUOUS DRAINING AND VENTING ...SARCO FT STEAM TRAP

When you install the Sarco Float-Thermostatic Steam Trap you can depend upon it to discharge condensate continuously, at steam temperature, completely and without shock. Its thermostatic air vent removes immediately and automatically all air and incondensable gases reaching the trap. The FT never interferes with temperature regulation—because it never causes pressure fluctuations in the space being drained.

That's why the Sarco Type FT meets the special trapping requirements of heating coils—as well as steam main drips, unit heaters, heat exchangers, and other applications demanding accurate temperature control.

WRITE FOR SARCO FT BULLETIN

Remember that Sarco can give you *impartial* advice on steam trapping because *only* Sarco makes all 5 types: Float-Thermostatic...Thermostatic . . . Liquid Expansion . . . Thermo-Dynamic . . . Bucket.

2170

SARCO

SARCO COMPANY, INC.

635 MADISON AVENUE, NEW YORK 22, N.Y.

PLANT: BETHLEHEM, PA.

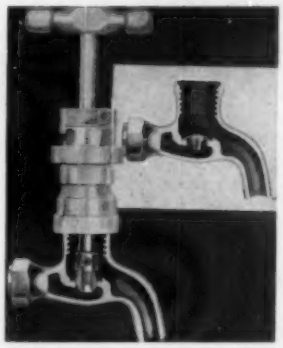
NEW PRODUCTS

(Begins on page 196)

ing, among others. It is said to be safe on hands, painted surfaces, yet powerful enough to remove heaviest soils. Turco Products, Inc.

16—FAUCET SEAT TAP prolongs fixture life

With the aid of this faucet seat tap, faucets and small valves with non-removable seats that become worn, pitted, grooved or corroded need not be discarded, it is stated. Such fixtures can be tapped for installation of company's full-saddle removable seats. Manufacturer says the whole operation takes only a few minutes—the steel tap has a tapered end which simultaneously reams out the defective seat's inner diameter to the proper size while forming the thread for screwing the removable seat in place. The top fits company's faucet seat reforming tool which is designed to attach to any style and type of fixture. This tap can also be used for installing the full-saddle removable seats on fixtures with odd-size removable seats for which replacements are difficult or impossible to secure. The taps come in five sizes chosen to permit use on hundreds of makes and types of faucets and small valves, regardless of original size of seat or washer. J. A. Sexauer Mfg. Co., Inc.



17—SOLVENT ADDITIVE eases tough cleaning jobs

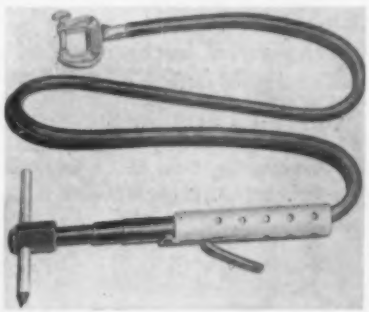
To speed removal of unusually stubborn compounded soils, Oakite Acalaid is added in the range of 5 to 10 per cent by volume to company's acidic or alkaline solutions to increase their power and efficiency. It is economical because you use it only where needed to boost standard solutions, says manufacturer, and it may eliminate need of more concentrated and more expensive cleaners. It may be used in tanks at temperatures between 140 and 160 F; and in closed systems at temperatures between 180 and 200 F. Field tests are reported to show it effective in cleaning heat exchangers and processing columns. It is neutral in pH, assuming that of the solution to which it is added. It is described as having a pleasant, aromatic odor, and as containing no phenols, so that disposal of spent solutions presents no special problem. Oakite Products, Inc.

18—CHART RECORDER six-channel, rectilinear type

This instrument provides six independent non-overlapping and continuous records within a compact unit only 12¾ in. wide, 9-13/16 in. high and 8¾ in. deep. It is suited for recording volts, milliamperes, or other variables available as outputs from electrical or electronic systems. Major features announced include sensitivity to 1 ma full scale; 1.0 sec response time; interchangeable pens for ink or inkless recording. Two, three, four and five channel models are available, and channels can be mixed. Chart speeds are from ½ in. per hour to 24 in. per minute. Princeton Div., Curtiss-Wright Corp.

19—CARBON ARC BURNER for battery repair jobs

Easily toted in a tool box, this carbon-arc lead burner is handy for on-the-site repairs to industrial storage batteries, as well as for general heating work. Power for the flameless electric burner can come from the battery being repaired (if sufficiently charged) or from an automotive battery. For batteries like those used in electric trucks, the burner is suited for using such lead parts as intercell and intertray connectors. It has a pencil-tip carbon heating rod to melt the lead and offers a fast, convenient means of removing connectors. It can also be used with chisel-point heating rods—intercharged by squeezing the lever of a spring clamp—to weld terminal-post seal rings found on stationary-type batteries. For use on 6 v d-c, this lead burner operates.



New DAY "RJ" Dust Filter

CONTROLS DUST
SAVES DOLLARS

only
3
moving
parts

Built under patents
of The DAY Company
and H. J. Hersey, Jr.

Because of its new, simplified design the DAY "RJ" dust filter will save you many dollars on initial investment, installation, operation and maintenance. Some of the important new construction features of this dust filter are: a new, quick-opening reverse-air, counter-flow valve for maintaining filter media porosity; a new, reverse-air pressure blower arrangement, and new, air tight, yet quickly opened inspection doors.

This patented DAY dust filter has only 3 moving parts but controls dust effectively, efficiently (99.99+%) and economically. It represents the latest refinement in a long-tested, plant-proven dust filter. Using felted filter sleeves to capture dust, the "RJ" is now available in 5 sizes for handling from 300 to 6400 CFM of air (for larger capacities, multiple groupings are furnished).

For more detailed information write toDAY for free Bulletin G-30. It's filled with facts, specifications and dimensions.

The DAY Company

SOLD in UNITED STATES by
The DAY SALES Company
807 Third Avenue N.E.
Minneapolis 13, Minnesota
FEderal 6-9671

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EXPERIENCE ENGINEERED . . . LABORATORY TESTED . . . PLANT PROVEN
Dust Control • Pneumatic Conveying • Bulk Storage
EQUIPMENT . . . SYSTEMS . . . INSTALLATION

For more facts circle 600 on Reply Card

NEW PRODUCTS

(Begins on page 196)

from three series-connected lead-acid cells.

The burner itself, a heavy-duty tool with thick plastic handle, cable and connector clamp, costs around $22.00. A box of six pencil-point carbon rods costs under $2.50 and one of chisel point rods, sells for less than $2.00. Exide Industrial Div., The Electric Storage Battery Co.

20—WASTE CONTAINER designed to stop fires

When a fire starts inside it, the Flame-Tamer Waste Receptacle uses the smoke from that fire as an extinguishing agent. Smoke is diverted across the opening and back toward the fire

—to prevent oxygen from reaching the flame. The receptacle is open for use at all times, even when extinguishing a flame, it is pointed out; it works without chemicals or moving parts and requires no maintenance. Four models are available, including the 30-gal industrial one illustrated. The Flame-Tamer head is also available separately for application to standard drums. Rock Royal Corp.

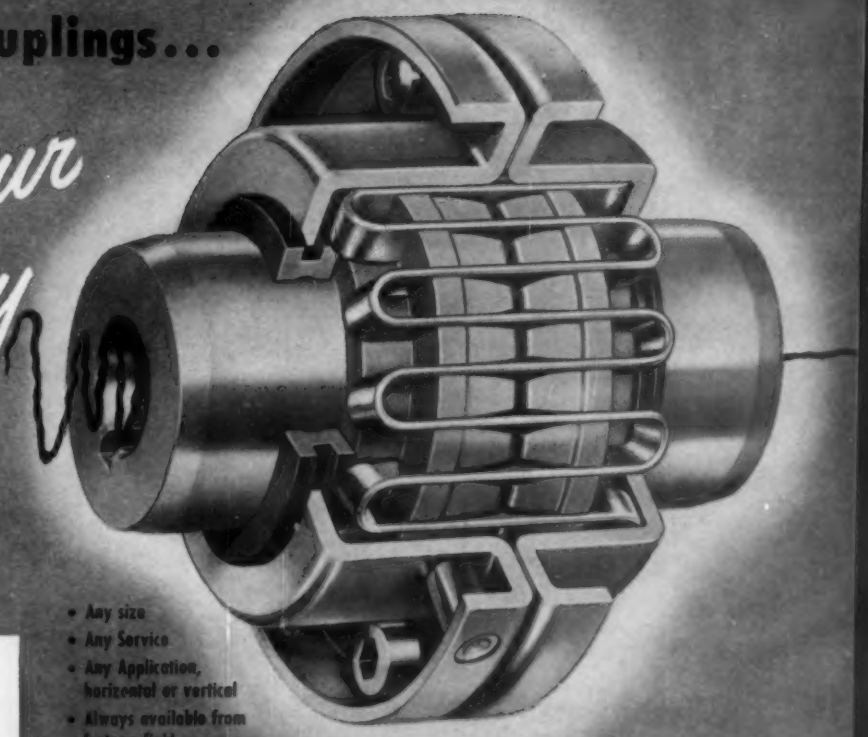
21—PRESSURE GAGE is multi-purpose unit

Gearcoid Gage Type 110 is a heavy-duty, geared movement pressure gage with a wide range of applications. It is suggested for oil, air, water, steam, gas or other media not corrosive to brass or bronze. Integral design of the socket, tube, tip, movement, pointer and dial assembly permits installation by hand-turning the gage case. Long wear and consistent accuracy are attributed to use of bronze-bushed pinion and segment shafts, nickel silver pinions, stainless steel hairsprings, geared type movements mounted directly to socket shank, and phosphor-bronze Bourdon tubes with silver-brazed joints.

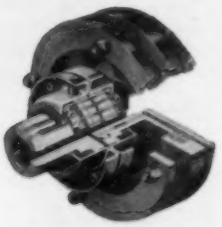
The gage comes in many standard

Falk Steelflex Couplings...

Protect your machinery in 2 ways



- Any size
- Any Service
- Any Application, horizontal or vertical
- Always available from factory, field or distributor stocks



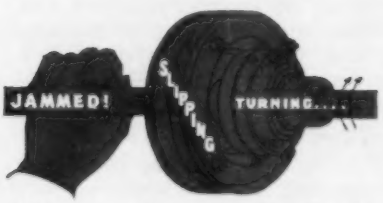
FALK and STEELFLEX are registered trademarks

Falk Controlled Torque Couplings prevent damage from overloads

In applications where danger from overloads exists, use the FALK Type FT Controlled Torque Coupling. The Type FT has all the features and advantages of standard FALK Steelflex couplings—and, in addition, has an adjustable friction slip clutch, enabling the operator to set the coupling to slip at any predetermined overload.

This controlled-torque principle not only prevents transmission of dangerous shocks and limits overloads; it eliminates the breaking of shafts caused by jamming of driven equipment.

An outstanding advantage of the Type FT Coupling is that, as soon as the cause of the overload is removed, the entire coupling will rotate and transmit power without replacing parts or repairing coupling.



There's real economy in using Type FT Controlled Torque Couplings. Many users have reported that these couplings paid for themselves the very first time they slipped (under overload) because of the protection against damaged driving or driven machinery!

...cost less per year of service!

You get *double protection* when you connect your driving and driven machinery with a Falk Steelflex Coupling—the all-steel coupling with the exclusive grid-groove design! First, its *torsional resilience* smothers shock and vibration; and second, the Steelflex design prevents damage and lowered efficiency by accommodating shaft misalignment.

Why have increasing numbers of key men in industry standardized on Falk Steelflex Couplings? Their experience has proved that Falk Steelflex Couplings prolong the service life of their machinery... are trouble-free and need minimum maintenance . . . are easy to install, lubricate and disconnect . . . and *cost less per year of service* than ordinary couplings.

One basic Steelflex design—the type F, in its many sizes—is adaptable to more than 90% of all industrial applications. For applications involving danger from overloads, Modified Type FT Controlled Torque couplings (see column at left) are ideally suited. There are numerous other special or dual purpose Steelflex couplings for unusual applications. **Write to Department 247** for engineering bulletin, including selection and dimension tables.

THE FALK CORPORATION, MILWAUKEE, WISCONSIN

FALK

...a good name in industry

MANUFACTURERS OF:

- Motoreducers
- Speed Reducers
- Flexible Couplings
- Shaft Mounted Drives
- High Speed Drives
- Special Gear Drives
- Single Helical Gears
- Herringbone Gears
- Marine Drives
- Steel Castings
- Weldments
- Contract Machining

For more facts circle 601 on Reply Card

HERC-ALLOY

THE ORIGINAL ALLOY STEEL CHAIN

Herc-Alloy has many superior features ...has high tensile strength...is lighter, therefore easier to handle... is long wearing...offers high resistance to impact loading...is INSWELL welded.

Herc-Alloy is sold in running lengths and in all types and sizes of sling chains assembled to customers' specifications. CM also produces a complete line of chain attachments and welded chain of all types including stainless steel.

● Write for Data Book covering Herc-Alloy Sling Chains, including helpful information on their assembly, care, use and inspection.

***Hammerlok*®**

COUPLING LINKS

● Assemble or rebuild your own Herc-Alloy sling chains with all components furnished by your local distributor. Hammerlok is simple, safe, reusable. New Herc-Alloy assemblies can now be ordered with welded or Hammerlok Coupling Links as desired.

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For more facts circle 602 on Reply Card

NEW PRODUCTS

(Begins on page 196)

ranges from 0-15 to 0-1000 psi; compound ranges of 15/30 to 200/30 in. vacuum, and in a vacuum range of 30 in. -O vacuum range. It can be connected into the pressure line through a ¼ in. NPT bottom connection. Helicoid Gage Div., American Chain & Cable Co., Inc.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 271-272.

22—LIMIT SWITCH does the work of two

This plug-in limit switch can do the work of two separate limit switches in many cases, manufacturer says. The switch (Catalog 301LS1) contains two 2-circuit double-break switches which can control four isolated circuits. The roller lever actuator, when moved to

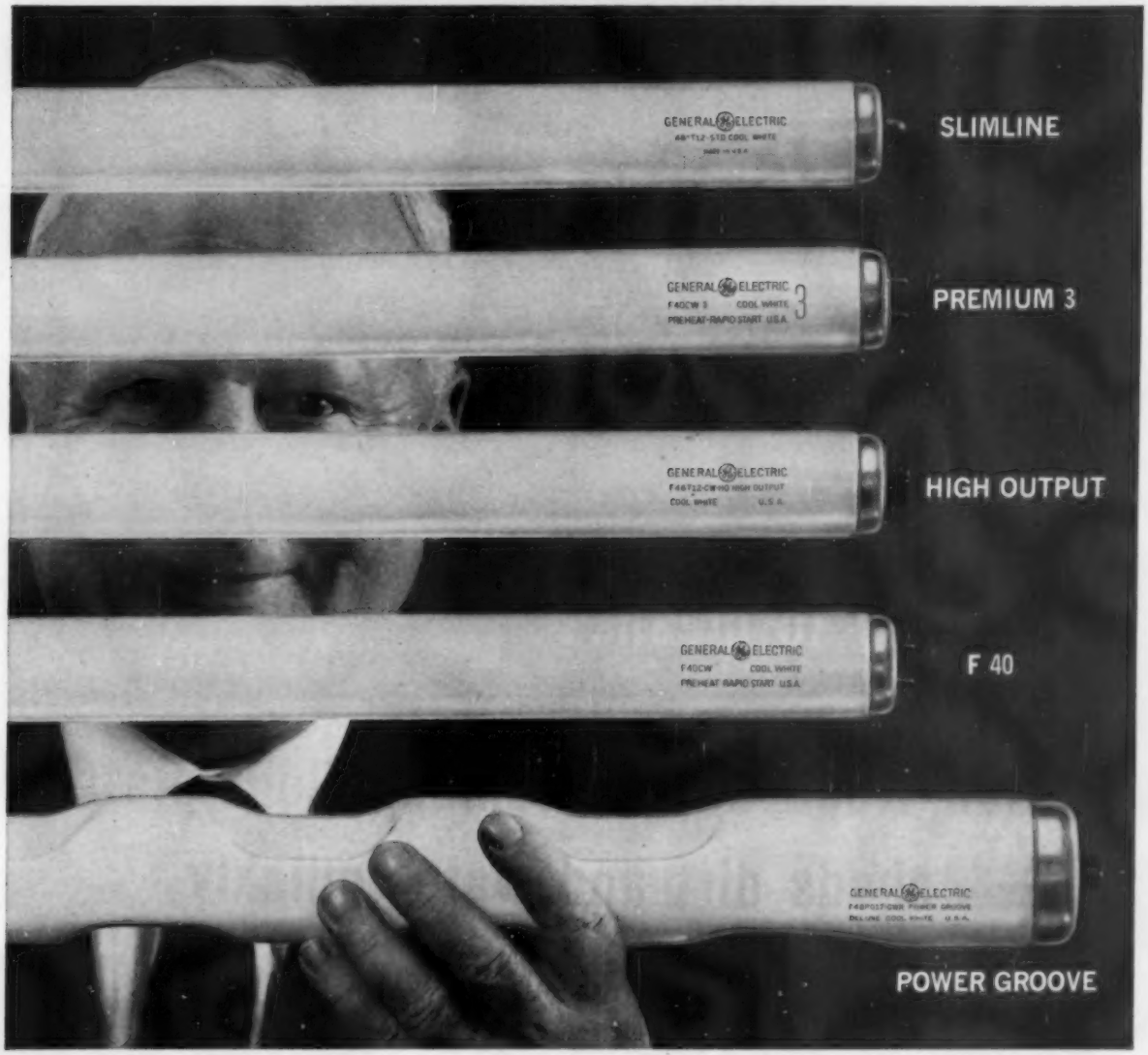
the left, operates one of these basic switches and, moved to the right, operates the other. Operating characteristics are the same in either direction. Basic switches and terminals are mounted in rugged diecast aluminum housings, and when properly connected to a sealed conduit the complete assembly (switch plus mounting block, shown) is oiltight. According to manufacturer, the double duty capability can result in savings in time, space and wiring, and simplify actuating systems. Micro-Switch, Div., Minneapolis-Honeywell Regulator Co.

23—HEAVY DUTY PUMPS for solids handling service

Designed to meet severe operating conditions found in process and allied industries, these heavy-duty pumps have a capacity range to 9500 gpm, heads to 220 ft. Manufacturer says these process pumps are especially

For more facts circle 601 on Reply Card

General Electric Fluorescent Lamps SAVE YOU MONEY



Take initial cost for example:

NEW G-E POWER GROOVE FLUORESCENTS CAN SAVE YOU $15 TO $85 PER LAMP!

General Electric's Power Groove* Lamp is the most powerful, most popular high intensity fluorescent you can buy. Because it *delivers* more light, you can have brighter plants, offices, stores, even outdoor lighting *while using fewer lamps and fixtures.*

Thus you can save, on initial cost, $15 to $85 per lamp over previous fluorescent types, depending on the installation. It's all because of the grooves in the tube which bend the arc stream and lengthen it to create extra light.

G-E Power Groove Lamps are a product of the same General Electric Lamp research that has improved *every* G-E Fluorescent you buy—whether it's the slimline, high output, or one of General Electric's two new 40-watt lamps.

WHICH G-E MONEY SAVER LAMP IS YOUR BEST BUY? There's one that will solve any lighting problem. And General Electric's published record of performance leadership is your assurance that, if you use G-E Lamps exclusively, your lighting system stays up-to-date automatically. For more information call your G-E Lamp distributor or write: General Electric Co., Large Lamp Dept. C-010, Nela Park, Cleveland 12, Ohio.

*General Electric trademark for its non-circular cross section fluorescent lamp

Progress Is Our Most Important Product

GENERAL ELECTRIC

General Electric . . . where bright ideas become better lamps

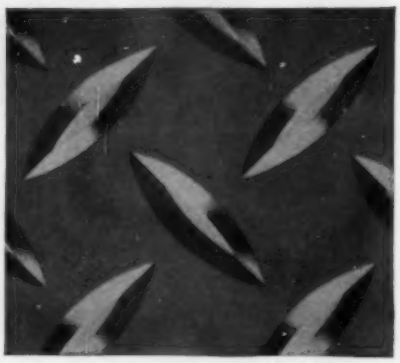
For more facts circle 603 on Reply Card

Alan Wood Super Diamond floor plate sheds dirt and water quickly

Sweep it, hose it or mop it—A. W. Super Diamond rolled steel floor plate has no pockets to hold dirt or water. The perfectly designed pattern of Super Diamond makes it the easiest-cleaning floor plate on the market today. You can shear, form, weld and match this floor plate wherever necessary, and the unique arrangement of the pattern allows you to bend it any place.

Super Diamond has many other advantages, too . . . an easily matched well-known design pattern . . . and readily available from warehouses. It wears indefinitely, with no chipping, cracking or splintering. And feet get traction from *every* direction, even when plates are wet.

For safety . . . for easy installation . . . for long wear . . . specify Alan Wood Super Diamond. Write for Bulletin SD-S3.



ALAN WOOD STEEL COMPANY

CONSHOHOCKEN, PA.

DISTRICT OFFICES AND REPRESENTATIVES: Philadelphia • New York • Los Angeles • Boston • Atlanta Cincinnati • Cleveland • Detroit • Houston • Pittsburgh • Richmond • St. Paul • San Francisco • Seattle Montreal, Toronto and Vancouver, Canada: A. C. Leslie & Co., Ltd.

For more facts circle 604 on Reply Card

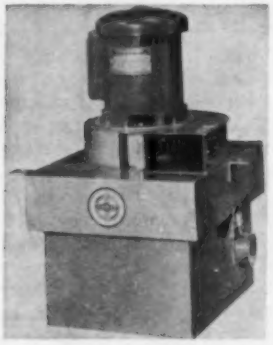
NEW PRODUCTS

(Begins on page 196)

adapted for handling fluids with fibrous, granular or other solids in suspension, abrasive or non-abrasive; handling thick liquids of all types, such as paper stock, starches, slimes, slurries; operating conditions involving temperatures to 350 F and working pressures to 400 lb. Pumps are end suction, vertically split type, with back pull-out assembly which gives accessibility to rotating parts without disturbing pipe connections. Standard discharge connections are 45-deg, self-venting. Seven types of materials of construction are available, including stainless steel. Bulletin 725.5 gives full data. Goulds Pumps, Inc.

24—DUST COLLECTOR is small, low-cost unit

Model 301 is announced as a compact, low-cost industrial dust collector suitable for use in any light dust-producing operation. It stands only 21½ in. high and occupies a space 12-by-14 in. Because of its small size, it can be

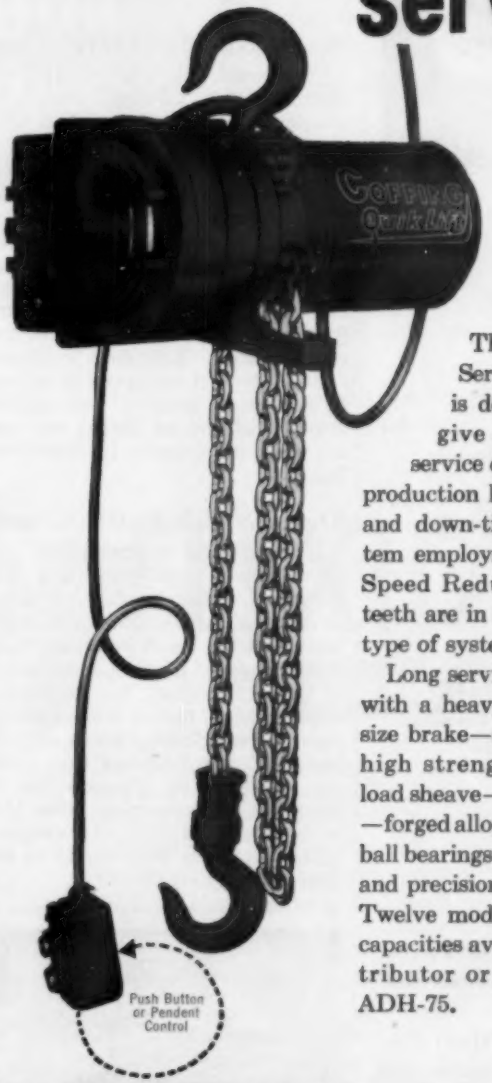


located on or under work benches, and is claimed particularly suited to dust control in electronic and other precision production as well as any light or occasional manufacturing operation producing dust. Performance ratings under standard test conditions are given as: 200 cfm, velocity 4100, static pressure 1.7 in. wg., inlet 3 in. It is equipped with a ⅓ hp motor. Torit Mfg. Co.

25—REGULATOR controls temperature, pressure

This unit is designed to control temperature and pressure with only one regulator in the main line. It anticipates temperature change through pressure sensing mechanism. Sliding gate seats are self-cleaning and self-lapping in operation. Designed for heating and cooling appliances, unit is available in ½- to 2 in. sizes with

RUGGED for long and constant service



The Coffing Quik-Lift Series S Electric Hoist is designed and made to give dependable cycling service day after day on your production lines. To reduce wear and down-time the gearing system employs the patented Perry Speed Reducer in which more teeth are in mesh than any other type of system.

Long service life also is built in with a heavy-duty motor—oversize brake—safety limit switch—high strength, wear-resistant load sheave—alloy steel link chain—forged alloy hooks—heavy-duty ball bearings—lifetime lubrication and precision machined housings. Twelve models with ½ to 3-ton capacities available. Ask your distributor or write for Bulletin ADH-75.

COFFING HOISTS

DUFF-NORTON COMPANY

826 Walter Street • Danville, Illinois

COFFING HOISTS
Ratchet Lever • Air
Hand Chain • Electric

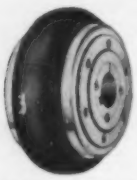
DUFF-NORTON

DUFF-NORTON JACKS
Ratchet • Screw
Hydraulic • Worm Gear

For more facts circle 605 on Reply Card

TORQUE-ARM

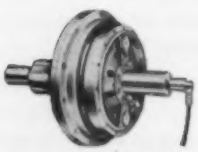
America's most widely used shaft mounted speed reducers!



DODGE PARA-FLEX

The Flexible Cushion Coupling

with the 4-way flex!



AIR-GRIP CLUTCHES

Amazing sensitivity — instant response!

●

Write for Bulletins!

- ✓ Torque-Arm—55 models—complete data.
- ✓ Para-flex Couplings—data.
- ✓ Air-Grip Clutches—technical data.

DODGE MANUFACTURING CORPORATION
2700 Union Street • Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

For more facts circle 606 on Reply Card

NEW PRODUCTS

(Begins on page 196)

screwed ends. Standard body materials are ductile iron (Model 1168) or bronze (Model 1268). It is suitable for pressures to 250 psi and temperatures to 500 F, designed to control temperatures from 35 to 450 F and 10 ranges and pressures of 2 to 200 psi with two ranges. Bulletin SRBc 4-60 gives data. OPW-Jordan Corp.

26—WATER-REPELLENT is improved, silicone type

Hydrocide S-X Colorless Hycon is described as an improved silicone type masonry water-repellent especially resistant to the destructive alternating freeze-thaw cycles. Tests are reported to show it more effective and longer lasting under severe conditions. Tests were conducted on premise that water absorption increases upon continued exposure to freeze-thaw cycles, regardless of product or concentration of application. According to manufacturer, level of absorption in masonry to which product was applied showed virtually no change over entire span of exposure. L. Sonneborn Sons, Inc.

27—SEWAGE PUMP is compact and submersible

Demersible Sewage Pump is a submersible combining pump and motor in one compact unit. Motor is sealed and oil filled in a cast iron case. Pump can be installed for temporary service or permanently set for continuous service. Pumps feature semi-open type impeller, self-cleaning action on suction head face, stainless steel pump and motor shafts. Controls can be located in any convenient place. Unit is furnished with 30 ft of waterproof cable. Capacities are from 25 to 800 gpm. The Deming Co.

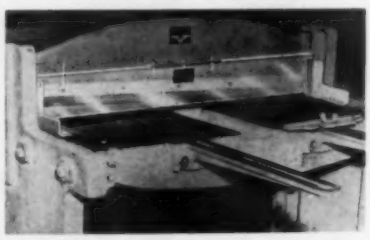
29—ROUTING SYSTEM directs containers on conveyors

Model 450 Conveyor Routing System is designed to automatically direct tote boxes, cartons and other containers to selected stations on a conveyor line. Either single units or "trains" of containers can be handled, and the system is designed so that the container can be diverted at any station, processed, and placed back on the conveyor. A dispatcher controls the system from the console; he selects routes by depressing station keys and the coded instructions are automatically placed on the container by an inking printer. Code reading carton selectors serve to control the direction of flow. Atronic Products, Inc.

30—LEVEL CONTROLS for use with problem liquids

NM-1 and NM-2 Magnetrols are low-cost liquid level controls in which all parts in contact with liquids or vapors are non-metallic; they are suggested for use with liquids that present problems in handling. Polyvinyl chloride is the non-metallic material used. Among advantages announced are immunity to galvanic or electrolytic attack and to oxidizing agents; corrosion resistance; smooth surface to discourage any tendency to scale or act as host for deposits. Also, it is noted, these controls do not contaminate or impart odors or tastes to the liquid.

(Continued on page 212)

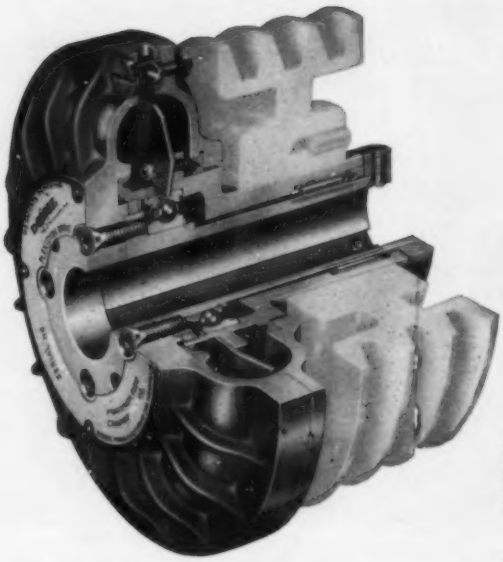


28—PLASTIC GUARD for metal cutting shears

Protection with visibility is the function of the Brett Ful-Vu Shearguard. Made with Plexiglas, this guard is designed to protect the shear operator while letting him see the cutting blade at all times, through the ¾-in. thick Plexiglas shield. The unit is adjustable for metal thicknesses used in shear operations such as cutting metal full length at one stroke, resquaring sheets cut roughly in mill shears, shearing sheets into strips, trimming edges of sheets, and cutting square, rectangular or other straight-sided blanks. It is said to permit cutting any legnth or width up to listed nominal cutting length. The Plexiglas is 4 in. wide, extending across the front of the shearing knife. The guard is fastened to the two side blade housings at each end of the shear frame, and located so as to be ⅜ in. above top of the shear table. Bottom edge of guard is recessed where necessary in order to clear the table guides. Brett-Guard Corp.

WHAT'S YOUR PROBLEM?...

- ☑ Overheated motors?
- ☑ Excessive belt maintenance?
- ☑ Breakage of materials being processed —like thread, wire, paper?
- ☑ Expense of oversize or high torque motors?
- ☑ High demand rate?
- ☑ Expense of reduced voltage starters?
- ☑ Clutch trouble?
- ☑ Breakage of transmission parts due to instantaneous shock loads?
- ☑ Damage and recurring down-time from overloads?



FLEXIDYNE

THE DRY FLUID DRIVE

It is no longer necessary to accept the destructiveness—the costliness—of conventional starting in the mechanical transmission of power. Flexidyne changes that!

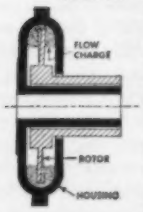
Flexidyne is the new way to start loads *smoothly*—to protect against shock and overload—to save power—all *without any sacrifice of efficiency at full load!*

This revolutionary development is ushering in "the day of the soft start"—which can mean thousands of dollars to you in equipment savings and in better, more economical operation.

Flexidyne is available, off the shelf, in Drives and Couplings. Capacities range from fractional to 1,000 hp. Ask your local Dodge Distributor or write us for technical bulletin.

DODGE MANUFACTURING CORPORATION, 2700 Union St., Mishawaka, Ind.

HOW FLEXIDYNE WORKS



The "dry fluid" in Flexidyne is tiny heat-treated steel shot. A measured amount, called the "flow charge," is contained in the housing, which is keyed to the motor shaft. Inside the housing is a rotor, free to revolve relative to the housing, but connected to the load.

When the motor is started, centrifugal force throws the flow charge to the perimeter of the housing, packing it between the housing and the rotor, which transmits power to the load. Initial slippage is momentary. Housing and rotor become locked together and achieve full load speed without slip and at 100% efficiency.

CALL THE TRANSMISSIONEER — your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look in the *white* pages of your telephone directory for "Dodge Transmissioneer."

DODGE

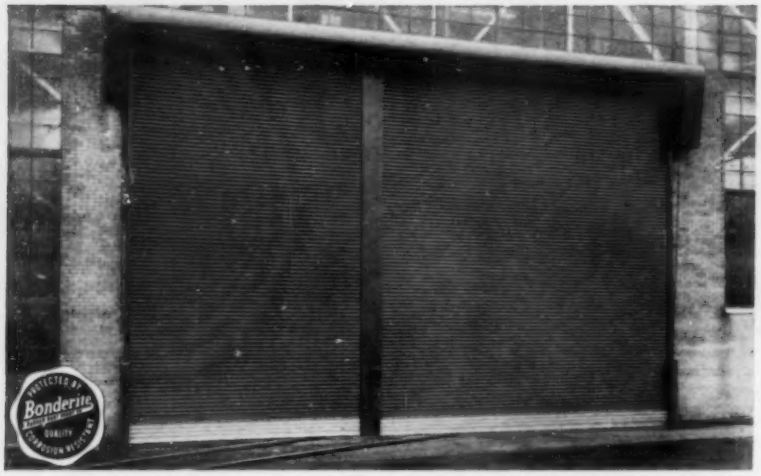
of Mishawaka, Ind.

For more facts circle 607 on Reply Card

MAHON ROLLING DOORS...

versatile space-savers

THAT OUTLAST ALL OTHER TYPES



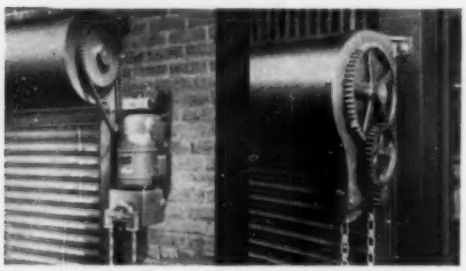
Versatility at Work—Mahon Doors as installed for Fitzsimons Mfg. Co., Detroit. Here, a Railroad and Truck Door are combined into a dual-purpose unit. How: a movable mullion . . . application-engineered by Mahon . . . permits easy access through either or both doors.

Door requirements differ . . . for commercial or industrial reasons, for in-plant railroad entry or truck-loading areas and from simple service doors to attractively functional institutional entrances. The range is wide. Yet, Mahon supplies Rolling Doors to suit your specific needs . . . standard or Underwriters' labeled . . . for new or old openings.

Mahon doors are rugged and precision assembled for easy operation—economically installed. Their fast, counter-balanced, vertical roll-up action saves expensive space and makes it completely usable. All-metal (either galvanized steel, stainless steel, aluminum or bronze) construction insure longer life, lower maintenance.

Whether you're building, modifying or replacing—investigate Mahon Rolling Doors . . . the doors and the advantages last.

MAHON MAKES ROLLING DOORS IN MANUAL, MECHANICAL OR POWER-OPERATED MODELS IN STANDARD OR UNDERWRITERS' LABELED TYPES



MAHON DOORS CAN BE POWER OPERATED . . .

CHAIN CRANK . . . OR MANUALLY OPERATED

MAHON BUILDING PRODUCTS

- Aluminum or Steel Curtain Wall (in natural or colored metals)
- Rolling Steel Doors (Standard or Underwriters' labeled)
- Metalclad Fire Walls (Underwriters' rated)
- M-Floors (Steel Cellular Sub-Floors)
- Long Span M-Deck (Cellular or Open Beam)
- Steel Roof Deck
- Acoustical and Troffer Forms
- Acoustical Metal Walls, Partitions, and Roof Deck
- Permanent Concrete Floor Forms

CONSTRUCTION SERVICES

- Structural Steel—Fabrication and Erection
- Steel Fabrication—Weldments

Write for Rolling Door descriptive literature. Also in Sweet's Files.

THE R. C. MAHON COMPANY / *DETROIT 34, MICHIGAN*

Manufacturing Plants—Detroit, Michigan and Los Angeles, California

Sales-Engineering Offices in Detroit, New York, Chicago, Los Angeles and San Francisco

Representatives in all principal cities

MAHON

For more facts circle 608 on Reply Card

NEW PRODUCTS

(Begins on page 196)

Safety in handling inflammable and explosive liquids, as well as in volatile fume areas, is another advantage, manufacturer states, due to non-flammable, non-sparking materials.

The controls are for use with liquids of specific gravity of 0.70 or above. Chamber and float construction are for service at 100 psi at 70 F, or 50 psi at 140 F. Model NM-1 Magnetrol is an external float cage unit with a sealed body and float totally enclosed. Model NM-2 is a flanged style chamber unit. Magnetrol, Inc.

31—AIR DIFFUSER with enclosed light troffer

This air-diffuser and light combination incorporates a ceiling diffuser unit by Barber-Colman Co. and light troffer and fixture by Day-Brite Lighting, Inc. The diffuser is available in 1-by-

4 and 2-by-4 ft sizes, and with two, three or four fluorescent tubes. Air distribution is provided through slots along both sides of the light fixture. A 5-ft expanding cone damper, for controlling air volume, is accessible by unlatching the bottom of the diffuser. Discharge air is separated from ballasts, fluorescent tubes and reflecting surfaces. Data Sheet F-9558 gives further details. Barber-Colman Co.

32—FOUR CLEANERS cover many industrial uses

Four cleaning compounds for metal parts are included in the Cerfa-Kleen series. These are tailored to requirements of four basic industrial metal cleaning. Cerfa-Kleen HPW (hot power washer) is a heavy-duty compound reported as non-foaming, non-caking. Rust preventive is added. Cerfa-Kleen CPW (cold power washer) is a formulation of mild, fast-dissolving alkalies usuable at room temperature. It is described as non-foaming, non-caking and non-dusting. Rust preventive and water softener are added. Cerfa-Kleen HST (hot soak tank), a high detergency compound for fast immersion in hard water, is also reported non-caking and non-dusting. Cerfa-Kleen CST (cold soak tank) is a concentrated liquid to replace toxic or flammable solvents, and is also suited for "wipe-off", tumbling and other mechanical

Another Engineering Achievement

NEW TYPE A-PLUS SAFETY SWITCHES

They're built like circuit breakers! These new switches stand at the head of their class in safety switch design. Get top marks in circuit protection with all these PLUS features:

Instantaneous contact action	PLUS	Visible blades for safety
High current carrying ratings	PLUS	High current interrupting capacities
Low maintenance cost	PLUS	Low initial cost
De-ionizing arc chutes	PLUS	Silver alloy contacts
Fingertip operation	PLUS	Large handle—clearly visible "ON"-"OFF"

There's a complete line of safest, coolest, heavy-duty Type A Switches from 30a to 1200a. See your authorized FPE distributor or write for Bulletin #1240. Federal Pacific Electric Company, General Offices: Dept. 460, Newark 1, New Jersey —The Best in Electrical Control, Distribution and Power Equipment.

COMMON SENSE NEUTRAL BARS

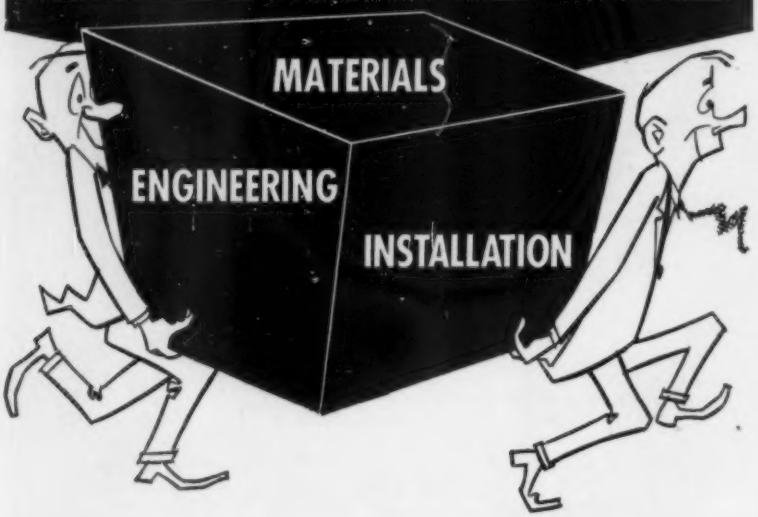
All switches 30A thru 200A have solid neutral blocks installed at no charge. On switches 400A thru 1200A, the neutral assembly is separately packaged for installation when required.

FPE FEDERAL PACIFIC ELECTRIC COMPANY

Affiliated with Cornell-Dubilier Electric Corporation

For more facts circle 609 on Reply Card

CEILCOTE OFFERS THE ONLY
COMPLETE PACKAGE
CORROSION-PROOFING SERVICE



✓ ONE SOURCE
✓ ONE CONTRACT

MONOLITHIC FLOORING
PROTECTIVE LININGS AND COATINGS
BONDING CEMENTS
GROUTING MATERIALS AND ADHESIVES
PLASTIC VENTILATING EQUIPMENT
PLASTIC PROCESS EQUIPMENT
INSTALLATION SERVICES

Now you can consolidate contracts . . . concentrate responsibility for corrosion-proofing service . . . save time and money! Ceilcote's "Complete Package" gives you the benefit of Ceilcote's extensive facilities plus 33 years of experience in developing, producing and installing corrosion resistant facilities. Working under contract, experienced Ceilcote engineers and competent installation crews handle all your problems and *guarantee job satisfaction!* Typical successful installations include flooring, tank linings, foundations, pits, piers, waste disposal systems as well as all types of Duracor reinforced plastic process equipment and ventilations systems. Write for complete information or call your nearest Ceilcote Sales Representative.

ALABAMA: BIRMINGHAM LY. 2-7201. CALIFORNIA: OAKLAND TE. 2-0103, SANTA ANA P.O. BOX 625. COLORADO: DENVER GL. 5-3651, WASHINGTON, D.C. OL. 6-4321. FLORIDA: CORAL GABLES MO. 5-1965. ILLINOIS: CHICAGO AN. 3-1881. INDIANA: EVANSVILLE HA. 3-3597. MASSACHUSETTS: SPRINGFIELD RE. 6-5203. MICHIGAN: DETROIT LA. 6-4800. MISSOURI: KANSAS CITY MI. 9-1312. NEW JERSEY: PRINCETON WA. 1-6969. NEW YORK: NEW YORK CO. 7-0276, ROCHESTER GR. 3-5918. OHIO: CINCINNATI EL. 1-5765, CLEVELAND ER. 1-4558. PENNSYLVANIA: PHILADELPHIA KI. 5-0720, PITTSBURGH AT. 1-8500. TENNESSEE: KNOXVILLE 2-5770. TEXAS: HOUSTON JA. 2-1606. WASHINGTON: SEATTLE SU. 3-9200.
CANADA: OTTAWA CE. 3-7785.

CEILCOTE
THE CEILCOTE COMPANY INC.
4915 Ridge Road • Cleveland, Ohio

9832-GC

For more facts circle 610 on Reply Card

NEW PRODUCTS

(Begins on page 196)

cleaning operations. All four compounds are announced as containing no free caustic. E. F. Houghton & Co.

33—UNIVERSAL GANTRY in heights up to 17 ft

The Magic Pole Universal Gantry has up to 6 ft of height adjustment and a wheel tread adjustable to narrowest aisles. The self-leveling I-beam is available in steel or aluminum

alloy. Trolley is free to travel the length of the beam. The legs fold against the I-beam for hauling or storage. Models are available in heights up to 17 ft spans to 15 ft, with maximum capacity of 4 tons. Any three legs plus a low cost tripod kit, available from manufacturer, can make a telescoping tripod. B. E. Wallace Products Co.

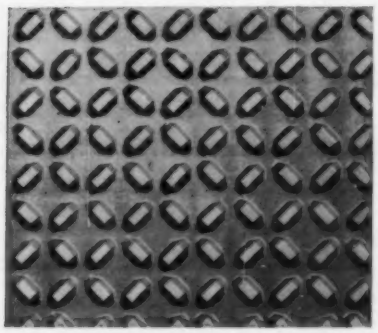
Use the Reader Service Cards provided on pages 271-272 to ask for more information on the products. Circle item numbers of products in which you are interested.

34—WIRING DEVICES are designed to resist corrosion

Readily identified by their bright yellow color, Chem Marine Wiring Devices are announced as resistant to corrosion, oils, greases and most acids. They are made of rugged materials. Insulprene and Melamine are the insulating materials. Monel is used in place of standard steel, and heavy nickel-plated brass replaces unplated brass for current carrying contacts. Manufacturer points out that the complete line is UL listed.

Chem Marine Devices are built around company's Twist-Lock and Grounding lines. The former is repre-

One slip can cost more than USS Multigrip



Your workers stand—and often fall—in slippery places. Falls account for about 1 in every 5 industrial injuries.

You can eliminate many slips and falls by installing USS Multigrip Floor Plate around machines, on loading platforms, stair treads and main shop aisles.

Multigrip means safe footing wherever it's used. Hundreds of little cleats give safe traction in any direction. Water drains off quickly. Oil and grease can be easily removed with the usual cleaning compounds.

Saves money, too! Where floors take a heavy pounding from traffic, Multigrip will stand up for years. It won't splinter or crack and can be installed in extra wide plates. There's little or no maintenance.

For more information about USS Multigrip Floor Plate, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS is a registered trademark

Sold by leading distributors from coast to coast.

United States Steel Corporation—Pittsburgh
Tennessee Coal & Iron—Fairfield, Alabama
Columbia-Geneva Steel—San Francisco
United States Steel Export Company

United States Steel

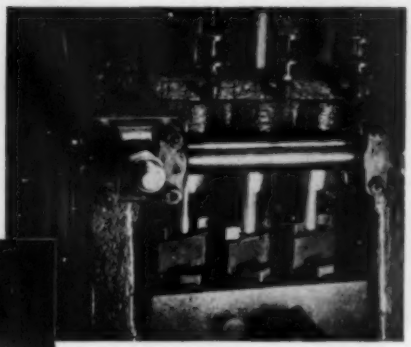
For more facts circle 611 on Reply Card

PACKINGS...
for Long-Service Savings

"LONG-LIFE" RED SHEET

For packing flanges and other parallel surfaces in service against hot and cold water, air, saturated steam pressures up to 150 lbs., and all hydraulic applications. Pliable, strong and firm to hold required pressures.

Thicknesses: 1/32", 1/16", 3/32", 1/8", 3/16", 1/4". Max. Width: 48"



"LONG-LIFE" MOLDED-LIP AND O-RING PACKINGS...

FOR AIR, GAS, OIL, CHEMICALS, STEAM, WATER, SOLVENTS

"If it's GOODALL, it MUST be Good!"

Contact Our Nearest Branch for Details and Prices

Standard of Quality—Since 1870

HOSE · BELTING · FOOTWEAR · CLOTHING AND OTHER INDUSTRIAL RUBBER PRODUCTS

GOODALL *Rubber Company*

GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.

BRANCHES AND DISTRIBUTORS THROUGHOUT THE UNITED STATES. IN CANADA: GOODALL RUBBER CO. OF CANADA LTD., TORONTO.

For more facts circle 612 on Reply Card

NEW PRODUCTS

(Begins on page 196)

sented by two- and three-wire caps, connectors and receptacles. Caps and connectors are offered with protective rubber covers which can also be used with receptacles in combination with lift cover plates. The three-wire, 15-amp, 125-v grounding devices are included for use with portable electric tools and equipment. A three-wire cap and connector body and a duplex receptacle make up the grounding line. A combination unit—weatherproof Insulprene plate and Presswitch—is offered to answer the need for an outdoor switch that is operative while enclosed. Harvey Hubbell, Inc.

35—STEEL BOOKCASES with adjustable sliding shelves

These steel bookcases, featuring sliding shelves adjustable on 1½ in. centers, are manufactured in two sizes —a two-shelf, desk-high model and

a seven-shelf library model. Book stops, 7-in. high can be used with both models—merely hook over front of shelf and snap in place. The desk-high bookcase (shown) has a rounded front edge on top and the library height models come with cornice top. The bookcases can be used individually or fastened together in rows. To remove or adjust shelves, you lift the front edge and pull. Both models are finished in gray baked-on enamel. Lyon Metal Products, Inc.

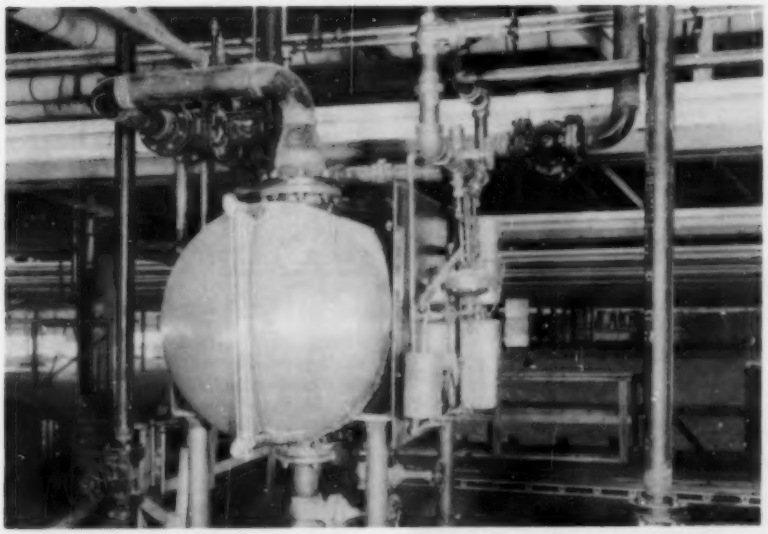
36—VOLTMETER is more accurate, easier to read

Improved readability and a 40 per cent increase in accuracy are highlights of this narrow range a-c voltmeter. Calibrated from 110 to 130v, the instrument is intended for application where holding voltage to a high degree of accuracy is required. High readability is attributed to the dial, calibrated in ½-v intervals, which is combined with nearly linear spacing

For more facts circle 613 on Reply Card →

BYERS GUIDE

Maintenance and Operating Tips from A. M. Byers Company



One of two batteries of condensate pumps installed in each of five similar buildings at General Electric Appliance Park, Louisville, Ky. To protect against damage from steam condensate corrosion, Wrought Iron Pipe has been installed for the return lines within each building and to the area's central boiler plant.

Seven Ways to Minimize Maintenance In Steam Condensate Systems

While selection of the right piping material precludes virtually all other factors in controlling condensate corrosion, additional service life can be squeezed from your existing system by following these helpful suggestions:

1. The feed water deaerator should be operated at or near boiling point, and should be maintained in an efficient condition.
2. All joints in return lines operating under sub-atmospheric pressures should be made airtight.
3. All horizontal return lines should be given sufficient slope or pitch to permit rapid and complete drainage.
4. All low points or pockets in the lines where condensate can collect should be eliminated or properly tapped.
5. Reaming of pipe ends to remove burrs is particularly important in condensate lines.
6. Cold water injection into return lines ahead of vacuum pumps should be avoided wherever possible.
7. Extra heavy nipples should be used in return lines.

Practically any application where steam condensate is conveyed through pipe is a "natural" 4-D Wrought Iron application. Here are two reasons why:

1. Ordinary metals corrode quickly and become costly maintenance headaches. Alloy steels increase initial costs greatly.
2. 4-D Wrought Iron's corrosion-blocking film forms around the interior wall of the condensate line enabling the pipe to give long, maintenance-free service.

Incidentally, since the right piping material means so much to service life in steam condensate systems, you may wish to contact our Engineering Service Department staff. They maintain records and data spanning 60 to 75 years which show how long various materials endure in steam condensate service.

How D. L. Clark Co. Cuts Maintenance Costs 50%

"Because of the excellent service life of 4-D Wrought Iron Pipe in the plant, fewer pipe fitters and helpers are needed," says the mechanical superintendent at the D. L. Clark Company, Pittsburgh, Pa.

Here, at the home of the famous Clark candy bar, 4-D Wrought Iron Pipe, one-half inch to six-inch sizes, and 4-D Wrought Iron nipples are kept in stock. This pipe material is used for steam lines, condensate return lines, air lines, hot and cold water lines, and chocolate lines.

Mr. Robert Dunbar, the plant's mechanical superintendent, credits 4-D Wrought Iron with cutting maintenance costs approximately 50 per cent in his operation.

4-D Wrought Iron proves especially effective at the Clark Company against that old bugaboo, condensate corrosion. Let's review the nature of this nemesis for a minute. After steam loses its heat, it turns to moisture, which is distilled water greedy for gases. Any gas in the steam is readily absorbed into the condensate as it is cooled. The condensate becomes violently corrosive, depending upon the percentage of free CO_2 plus O_2 contained in the steam. Becomes downright costly, too, if allowed to rampage. 4-D Wrought Iron doesn't let it.

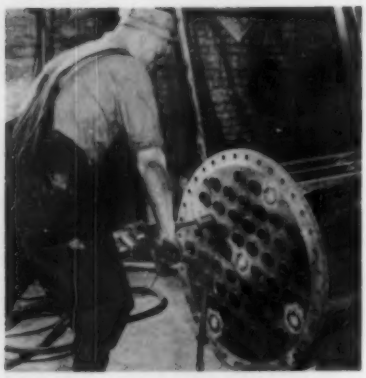
A Forging Tip or Two

In order to forge 4-D Wrought Iron successfully, it is necessary to heat it to at least 2300°F., and stop working it when it reaches a temperature of 1750° to 1800°F. At 2300°F., 4-D Wrought Iron gives a greasy heat. From 2500° to 2600°F., it will sweat.

Higher temperatures are essential in forging 4-D Wrought Iron because of its low carbon content. 4-D Wrought Iron with its low carbon content will take much more heat without burning than other materials with higher carbon. At the right temperatures, 4-D Wrought Iron is a cinch to work and form.

BYERS GUIDE

Maintenance and Operating Tips from A. M. Byers Company



How to Dry Sand With No Piping Downtime

Norton Company, Worcester, Mass., has a tough assignment for heat exchanger tubes: in a sand drier that removes moisture from the abrasive materials used in grinding wheels, refractories, laboratory ware, non-slip tile, and other products. The tubes, which carry steam or hot water, are housed in a rotating shell filled with the sand.

Tubes in this service are subject to the punishing corrosive action of the moisture in the sand as well as the abrasion of the sand as it rushes over the coils. The inside walls of the tubes are also subject to corrosive action because of the condensate they carry.

Water or moisture in the sand usually has a chloride content. And 4-D Wrought Iron's proven resistance to salt and brine effects provides an excellent basis for comparison in this service.

If corrosion or abrasion is playing hob with your piping coils, it could be you're using an inadequate piping material. Maybe it's time you investigated the advantages of 4-D Wrought Iron.

Right Pipe, Wrong Nipples, Premature Failure

In a steam condensate line installation in North Carolina, specifications called for wrought iron pipe to be used. Steel nipples, however, were selected for this corrosive service.

Within three years, the steel nipples began to fail. They were replaced with wrought iron nipples, and the steam condensate line has experienced no trouble since. Therein lies an object lesson.

4-D Wrought Iron nipples, preferably extra strong, should always be used in *any* piping system because the majority of failures occur at joints which should really have *extra* protection.

Identification is important, too. Here's how to be sure you get what you order. Byers 4-D Wrought Iron nipples, other than close nipples, are machine stamped with the word BYERS and STD for standard weight, or X STG for extra strong pipe. Close nipples bear a red band around the center. Couplings up to and including 14" are stamped with a "B" within a keystone. If you want durability—all the way down the line—insist on 4-D Wrought Iron nipples.

WHAT IS "4-D"?

Note: New 4-D Wrought Iron was achieved by substantially increasing the deoxidation of the base metal, slightly increasing the phosphorous content, and using a more siliceous iron silicate. Result is increased corrosion resistance, improved mechanical and physical properties.

Literature Available

Literature described below is available on request. For information on specific applications, write Byers Engineering Service Department.

New four-color booklet, **4-D Wrought Iron: A New Dimension in Corrosion Control,** discusses in detail Byers' latest product development. Includes a test section which is graphically illustrated and shows comparative corrosion resistance of 4-D Wrought Iron, standard wrought iron and other ferrous metals.

Information on facts affecting corrosion, comparative service records, and suggestions for minimizing maintenance are presented in our special report: **The Use of Wrought Iron in Steam Condensate Lines.**

Complete mechanical data on all Byers pipe and tubular products are available in the **Byers Pipe Catalog.** Discusses differences between 4-D Wrought Iron and steel. Includes specifications, pipe standards and measurements.

New ten-page bulletin, **Cold Drawn Wrought Iron Heat Exchanger and Condenser Tubes,** cites actual installations in which the use of 4-D Wrought Iron and other metal tubing in the same equipment permits service life comparisons. Lists cost-per-foot-per-year figures for each material and the corrosive conditions present.

For additional information on 4-D Wrought Iron, contact Byers Division Offices in the cities listed below.

The maintenance and operating items appearing in BYERS GUIDE #1 were prepared by the Engineering Service Department of

A. M. BYERS COMPANY

Pittsburgh 22, Pennsylvania

ATLANTA • BOSTON • CHICAGO • HOUSTON • NEW YORK • PHILADELPHIA
PITTSBURGH • ST. LOUIS • SAN FRANCISCO • WASHINGTON, D. C.

4-D Wrought Iron is immediately available and may be obtained through established distributors of Wrought Iron Pipe. Plate, bar, and other flat rolled products may be ordered direct.

Corrosion costs you more than Wrought Iron

NEW PRODUCTS

(Begins on page 196)

throughout the full scale. With accuracy increased from 0.5 to 0.3 per cent of mid-scale value, the new meter is said to provide readings accurate to within ±0.36 v. It uses a milliammeter element fed by a Zener diode circuit, which spreads 110-130 v over 95 per cent of the scale length. It is available for both 50/60 and 400 cycle duty, has a 2-sec response time. Two flange dimensions may be had: 4¼ in. (7.1-in. scale length) and 8¾ in. (14.2-in. scale length). General Electric Co.

37—HORIZONTAL RACK stores the heavy materials

Of heavy duty, ⅛- and ¼-in. steel, in box channel construction, this storage rack is said to give maximum visibility of material stored on each of its five horizontal levels. The basic model is 12 ft 4 in. wide, 8 ft 4 in. high by 3 ft 4 in. deep, and is

free-standing. Foot plates are pierced for anchoring to floor, if desired. Four support bars at each horizontal level are 3½ in. wide to provide flat, smooth surfaces which won't indent lumber or other soft material being stored. Additional 4-ft wide sections can be attached to the basic model. Racks are phosphate coated. Standard finish is baked-on green enamel, but other colors can be had at extra cost. The basic unit includes four upright assemblies, six stringers, six tie bars, and necessary hardware. Columbia-Hallowell Div., Standard Pressed Steel Co.

38—GLOW LAMPS shine brighter than ever

Re-creation of three models of this company's extra brilliant lamps into three additional models, the LNE 45, LNE 47 and LNE 48—all of which are five times brighter than the pattern—is announced. According to manufacturer, the new brilliances

FREE LIGHT cascades from 22,000 square feet of corrugated roof panels at Port of New York Authority Pier 1, Furman and Fulton Streets, Brooklyn. Panel fabricator: Barclite Corp. of America.

They wanted plastic glazing without fire hazard

This isn't ordinary plastic glazing.

It's made with Hetron,® the polyester plastic that can't spread a blaze.

Regular plastic panels are fine for daylighting where there's no code problem—and where fire isn't a potential hazard. But when either of these conditions exists, you need a panel you *know* is safe—because it passes industry-accepted tests.

That's what Hetron-based panels do. All the leading fabricators can supply you with them. You don't have to guess about them. They have the U/L label or Factory Mutual seal of approval right on them. They're designed to meet the stiffest codes.

These safer panels cost a little more. They're worth it because they give you —without fire hazard—big areas of soft natural light where you want it. No glare. Savings on electric light. No shades, blinds, or painting. *No breakage.* Quick, simple installation. Excellent weather resistance.

So specify with confidence. Write "Hetron-based" on the spec sheet. Then you know you're in the clear. If you'd like names of fabricators who can supply you, drop us a line.

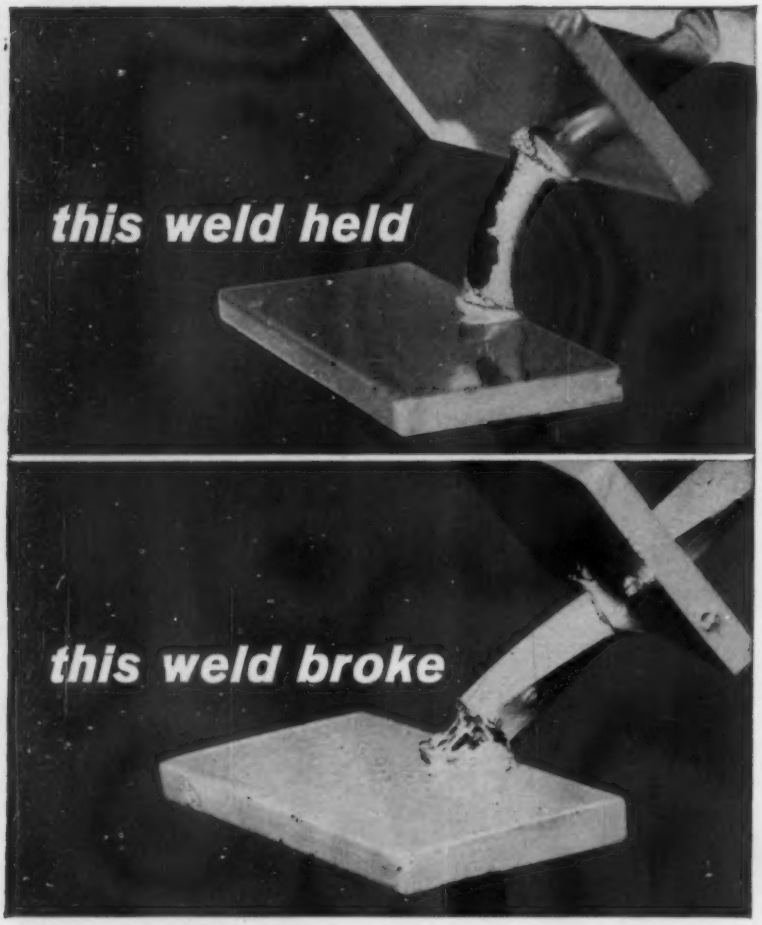
DUREZ PLASTICS DIVISION

3903 WALCK ROAD, NORTH TONAWANDA, N. Y.

HOOKER CHEMICAL CORPORATION

HOOKER CHEMICALS PLASTICS

For more Facts circle 614 on Reply Card



(Above) This DRAVO TRU-WELD GRATING was deliberately bent, placing far more strain on the welds than there would be in normal service. Not a single weld has parted. This grating will withstand vibration and hard usage.

(Below) **Bent in exactly the same way,** this grating came apart at the welds. The fusion of bearing bar to cross bar achieved by the Dravo method of manufacture prevents this from happening to Tru-Weld Grating.

the new stronger grating is

TRU-WELD

Tru-Weld grating is stronger because it is *made* that way. Its added strength comes from a manufacturing process that completely fuses the metal at cross bar-bearing bar joints and holds the bars to exact spacing. The result is grating that stands up under excessive vibration, heavy traffic or in areas where corrosive fumes and moisture are a problem. And Dravo Tru-Weld grating *costs no more.*

Complete estimating, layout and fabricating services are available. Immediate delivery from stocks maintained at nearby Joseph T. Ryerson Service Centers will help you meet exacting construction schedules.

For more information on this new, stronger grating — call the Dravo representative in your area, or write Dravo Corporation, Pittsburgh 25, Pa.

DRAVO
CORPORATION

For more Facts circle 615 on Reply Card

NEW PRODUCTS

(Begins on page 196)

were developed without changing the physical characteristics of the basic lamps (which are still in the line). The new lamps, however, operate at ½ w on 105-125 v a-c. instead of ¼ w and have a series resistance of 12,000 ohms (internal for the LNE 45, external for the other two) instead of the 30,000 ohms in the basic lamps. Signalite, Inc.

39—CO_2 WELDING GUN for use on mild steel

Model AH60-B is a manual gun for the Aircomatic (company's gas shielded metal-arc process) welding of mild steel using carbon dioxide as a shielding gas. The air-cooled gun has a continuous duty rating of 600 amp d-c when using "buried arc" CO_2 techniques. It can accommodate hard

welding wires from 0.035 through 3/32 in., fed from conventional Airco wire feeders. This gun has a lever type trigger, and a goose-neck nozzle assembly for ease of use in hard-to-reach areas. The number of cable connections has been reduced by combining both power cables and wire casing. It is declared particularly effective where rugged applications and high duty cycles are likely to be encountered. No tools are required for disassembly, and replacement parts are inexpensive. Air Reduction Sales Co., Div., Air Reduction Co., Inc.

40—CHEMICAL CONTROL for cooling towers

For feeding balanced chemical treatment into circulating water systems of cooling towers and evaporative condensers, the Chemicator is a small, lightweight, closed reservoir through which a portion of the recirculating water flows. It is mounted on the side of the equipment, and on its upper portion a sleeve holds a weather-sealed plastic tube containing a sequence of variously formulated compressed chem-

CLARAGE FANS FOR YOUR INDUSTRIAL AIR TRAVEL

Blowers and exhausters for
diversified industrial applications.

Standard models promptly available.

Clarage builds air handling and
conditioning equipment exclusively —
concentrated know-how!

When you want equipment designed
and built for "the long pull"—
to stretch your equipment dollar
to the utmost — call on
CLARAGE FAN COMPANY, Kalamazoo, Mich.

CLARAGE ... *dependable equipment for making air your servant*

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

For more facts circle 616 on Reply Card

NEW PRODUCTS

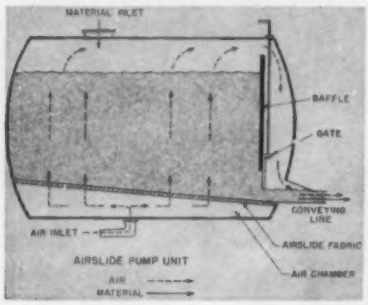
(Begins on page 196)

ical briquettes. These are made of polyphospates and organic chelates to remove and prevent scale formation, together with automatic pH, algae and slime controls. As the briquettes are gravity-fed into the water flowing through the reservoir, they slowly dissolve and are carried into the system.

It is pointed out that the Chemicator has no moving parts yet feeds chemicals in precise amounts; the flow of the recirculating water controls the system. Chemicals are fed only when the pump is in operation, and as needed. The Chemicator sells for around $20.00 to users of company's briquettes, and an installation is said to average around $5.00. The briquettes are custom formulated and packaged in combinations to combat water problems of any geographical area. Erlen Products Co.

41—TANK-PUMP COMBO controls bulk material feed

The Airslide Pump is a low-pressure tank and pump combination for feeding of dry bulk material into a pneumatic conveying line. A single source of air supply provides pressure for



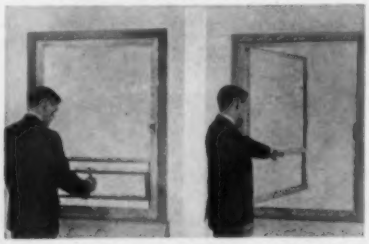
unloading, feeding and conveying. The unit may be mounted on truck, trailer, or skids and serves as a self-discharging bulk carrier. Essentially a tank in structure, the unit is of lightweight construction. Applications include handling of cement, fly ash, hydrated lime and zinc calcines. It is noted that control of the material discharge rate permits regulation of material-to-air ratios so that conveying can be accomplished at operating pressures below 15 psi. Fuller Co.

42—HYDRAULIC RAMS are single cylinder units

Nine sizes are available in this line of hydraulic rams, from one only 1-11/16 in. long with ⅝-in. stroke to a 20¼-in. long ram with 13½-in. stroke. Capacities are from two to 50 tons with maximum working pressures of 8650 and 10,000 psi. The single-acting rams are compact and lightweight, allowing easy application of hydraulic power to many operations. Owatonna Tool Co.

43—ALUMINUM WINDOW doubles as quick exit

Providing a means for quick evacuation of ground floor rooms, the Lupton Emergency Exit Window is hung on three half-surface hinges to let the complete window swing outward 180 deg from its frame. It resembles and can be used with standard projected windows, except that its double frame makes it appear slightly heavier. It



offers advantages of regular projected ventilator windows, such as air flow directed upward, protection from rain, ease of cleaning. Of heavy extruded aluminum, the windows come in widths from 2 ft 11 in. to 3 ft 4 in. and heights of 4 ft 1 in. to 5 ft 1 in. Right or left hand openings are available. Windows come also without projected ventilators or with horizontal muntins. Michael Flynn Mfg. Co.

44—CONTROL CENTERS offer operational benefits

These motor control centers with bus capacity from 200 to 2000 amp for voltages from 110 to 600 are announced as offering improved operation, easier maintenance and increased versatility over individual units. They are used to control electrical loads such as motors, lighting, welding, and heating. Available as fusible or circuit breaker combination units, the control centers consist of two or more starters fed from a common bus and are often attached to transformers or switchgear to form a unit substation. Substations can be purchased as a complete package or as individual units. Control compartments of like size are interchangeable anywhere in the control panel.

Features announced include: reduced engineering and installation cost; savings in floor space; versatility of unit through plug-in design; only one main circuit breaker needed for one center. Maintenance needs are readily met because of the central

G-B SNAP-ON DISTRIBUTORS

LISTED IN YELLOW PAGES

(See ad on facing page)

AKRON, Ohio, The Asbestos Supply Co.
ALBANY, Ga., Industry Insulation Co.
ALBANY, N. Y., Hudson Valley Asbestos Corp.
ALBUQUERQUE, N. M., Mt. States Insulation Co.
AMARILLO, Tex., McDonald Engineering & Insulating Co.
ATLANTA, Ga., Reynolds Aluminum Supply Co.
AUSTIN, Tex., Cinbar Engineering Co.
BALTIMORE, Md., Leroy Insulation Co.
BANGOR, Me., Eastern Glass Co.
BATON ROUGE, La., Eagle Asbestos & Pkg. Co.
BEAUMONT, Tex., Solar Supply Co.
BILLINGS, Mont., Big Horn Supply, Inc.
BIRMINGHAM, Ala., Reynolds Aluminum Supply Co.
Shook & Fletcher Supply Co.
BORGER, Tex., Western Chemical Co.
BOSTON, Mass., Homans-Kohler, Inc.
BUFFALO, N. Y., Industrial Insulation Sales, Inc.
CHAMPAGNE, Ill., Lewie David Co.
CHARLESTON, W. Va., Asbestos & Insulating Co.
CHARLOTTE, N. C., D&B Insulation Co.
CHICAGO, Ill., E. C. Carlson Co.
Culberg Asbestos & Cork Co.
CHILLICOTHE, Ohio, Southern Ohio Insulating Co.
CINCINNATI, Ohio, R. E. Kramig Co.
CLEVELAND, Ohio, Ohio Asbestos & Insulation Co.
COLUMBIA, S. C., Industrial Insulation Div. of
Richland Oil Co.
COLUMBUS, Ohio, Santeler Brothers
Culberg of Ohio
CORPUS CHRISTI, Tex., Precision Insulation Co.
DALLAS, Texas, Acme Insulation & Supply Co.
DAVENPORT, Iowa, Republic Electric Co.
DAYTONA BEACH, Fla., B & F Insulation Co.
DENVER, Colo., Gene Wright Lumber Co.
Powers Industrial Insulation, Inc.
DES MOINES, Iowa, Iowa Asbestos Company, Inc.
DETROIT, Mich., The Walter Rankin Co.
ERIE, Pa., Laco-McMullen Co.
EVANSVILLE, Ind., George Koch Sons, Inc.
FALCONER, N. Y., Laco Roofing
FT. SMITH, Ark., Gunn Distributing Co.
FT. WAYNE, Ind., M. H. Hilt, Inc.
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GREENSBORO, N. C., Starr Davis Co., Inc.
GULFPORT, Miss., Paine Supply Co.
HOUSTON, Tex., Precision Insulation Co.
INDIANAPOLIS, Ind., Lyon Lumber & Supply Co.
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JACKSONVILLE, Fla., Eckles Distributors, Inc.
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JOPLIN, Mo., Joplin Cement Co.
KANSAS CITY, Mo., Central Supply Co.
KEWANEE, Ill., Mechanical Insulation Co., Inc.
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LITTLE ROCK, Ark., Gunn Distributing Co.
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MOORHEAD, Minn., Fargo-Moorhead Insulation Co.
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NEW ORLEANS, La., Eagle Asbestos & Packing Co.
NEW YORK, N. Y., Eastern Steam Specialty Co.
ODESSA, Tex., Western Chem. & Supply
OKLAHOMA CITY, Okla., Ball Distributing & Engr. Co.
OMAHA, Nebr., Cardinal Supply & Mfg. Co.
ORANGE, Conn., Insulation Supply Co.
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PHOENIX, Ariz., Kircher Asbestos & Rubber Co.
PITTSBURGH, Pa., Keystone Div. of Dravo Corp.
PORTLAND, Me., Eastern Glass Co.
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RALEIGH, N. C., Reynolds Aluminum Supply Co.
RAPID CITY, S. D., Robbins & Stearns Wholesale
RICHMOND, Va., Reynolds Aluminum Supply Co.
ROANOKE, Va., C. E. Thurston Co.
ROCKFORD, Ill., Mott Brothers Co.
SALT LAKE CITY, Utah, Bullough Asbestos Sup. Co.
SAN ANTONIO, Tex., San Antonio Machine & Supply Co.
SAN DIEGO, Calif., Western Fibrous Glass Prod. Co.
SAN FRANCISCO, Calif., Western Fibrous Glass Prod. Co.
SAVANNAH, Ga., Reynolds Aluminum Supply Co.
SEATTLE, Wash., Western Fibrous Glass Products Co.
SHREVEPORT, La., Frith Sales Co.
SOMERVILLE, Mass., Insulation Products, Inc.
ST. LOUIS, Mo., The Stovey Company, Inc.
ST. PAUL, Minn., Asbestos Products, Inc.
SULLIVAN, Ill., Lewie David, Inc.
SYRACUSE, N. Y., Burnett Process, Inc.
TAMPA, Fla., Eagle Roofing & Art Metal Works, Inc.
TULSA, Okla., Ball Distributing & Engr. Co.
TUPELO, Miss., Paine Supply Co.
WASHINGTON, D. C., Walter E. Campbell Co., Inc.
WEST PALM BEACH, Fla., Southern Metal Prod.
WICHITA, Kans., General Metals, Inc.

For more facts circle 617 on Reply Card

They compared "K" factors and cost factors . . . and bought G-B SNAP*ON®

Here's how <u>you</u> can reduce the cost of insulating large pipe — simply use G-B Snap*On, the original one-piece pipe insulation molded of fine glass fibers. You can use G-B Snap*On in thinner wall thicknesses—*and obtain the same, or superior insulating efficiency*—for G-B Snap*On's thermal efficiency is unique among general-purpose pipe insulations. Application couldn't be easier or more economical—particularly when you use big 6′ one-piece sections that snap on big pipe quicker than you can say "G-B Snap*On!"

Compare these and many other G-B Snap*On advantages by asking your G-B distributor to make a TEVA (Thermo-Economic Value Analysis) survey the next time you plan to insulate piping, be it hot or cold, large or small, indoors or out. G-B Snap*On is available in the *complete* range of sizes from copper tubing to 36″ IPS . . . plain, or with a variety of weatherproof and vapor barrier jackets.

FOR FREE TEVA SURVEY CALL YOUR LOCAL G-B SNAP*ON DISTRIBUTOR (LISTED IN ADJOINING COLUMN)

GUSTIN-BACON *Manufacturing Co*

GUSTIN gb BACON

232 W. 10th St., Kansas City, Mo.

Thermal and acoustical glass fiber insulations . . . molded glass fiber pipe insulation
Couplings and fittings for plain and grooved end pipe

NEW FOR THE TOUGH JOBS...

Porter-Cable HEAVY-DUTY DRILLS

Added to the world-famous line of "professional" power tools are 10 *new* drills... a superior drill for every industrial operation, with the most popular chuck capacities and speeds.

These quality-built Porter-Cable drills deliver top *continuous* performance on a wide variety of drilling jobs. They last longer... because each motor specifically built for each drill eliminates vibration, delivers optimum power and speed... because finest precision ball bearings are used throughout... because the gears are cut with extra wide teeth for greater strength.

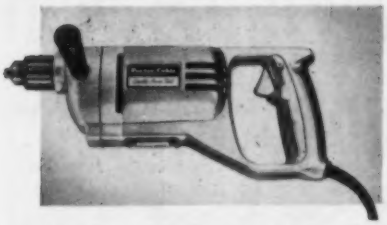
See them at your Porter-Cable distributor... or write for illustrated catalog with complete specifications.

PORTER-CABLE MACHINE COMPANY

6443 Marcellus Street, Syracuse 4, N.Y.

For more facts circle 618 on Reply Card

THE RIGHT DRILL FOR EVERY JOB...



New "D" Handle Drills—For in-line drilling on a wide variety of operations, there's a heavy-duty Porter-Cable Drill—from ¼" to ⅜". Full 3.6 amp power is delivered to rugged ½" dia. chuck spindle. Auxiliary side handle provides extra leverage.

New Heavy-Duty Pistol-Grip Drills—8 heavy-duty drills offering a variety of speeds and capacities for every job—from ¼" to ⅜" Full ball-bearing construction, steel alloy compound reduction gears... gasket-sealed, leak-proof gear housing.

New Keyless Chuck Ball-Bearing Drill—Model 355 is a heavy-duty ¼" all ball-bearing drill with precision keyless chuck for fast bit changes. Sealed chrome ball bearings permit instant hand locking and self-tightening of finest alloy steel chuck jaws. Gears enclosed in leak-proof, gasket-sealed housing.

See this complete line of Professional Drills at your Porter-Cable dealer or write for free illustrated folder.

Porter-Cable
Machine Company,
6443 Marcellus St.,
Syracuse 4, N.Y.

Porter-Cable
Quality Power Products

NEW PRODUCTS

(Begins on page 196)

location of the center. Increased safety is afforded through mechanical interlocks on each door which shut off current when door to cubicle is open. Allis-Chalmers Mfg. Co.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on page 271-272.

45—STEAM TRAP features a built-in union

Newest in this manufacturer's Quik-Flex line of industrial thermostatic steam traps is one with a union designed into the inlet of the trap itself. This union eliminates time involved in fitting a pipe to a union, as well as the cost of a separate union and materials. Maintenance is simplified, since the trap can be disconnected by loosening a single fitting. The built-in union is available in traps in ½- and ¾-in. sizes.

Quik-Flex traps are reported to have outstanding condensate and air removal characteristics due to a phosphorus bronze and Monel bellows with constant spring load that opens when contacted by cold air or condensate. A downward flow design with no retaining cores or passages serves to keep condensate from cooling and freezing in the trap. It is suggested for use with tracer lines, meter boxes, drips—for ordinary drainage, and wherever temperatures drop below freezing. The traps are designed to discharge, up to 31,000 lb of condensate per hour, for pressures up to 250 psi. Bodies are heavy duty bronze or semi-steel, valve and seat are Anderloy. Details are in Specification Sheet 2384. The V. D. Anderson Co.

46—POCKET CASE holds plant engineer's "tools"

This lightweight pigskin leather case will hold your slide rule, pen and pencil in your coat or shirt pocket—transfers easily from one pocket to another with everything in place. A compartment in the back holds notepad or letters, and the large steel clip is encased in leather to protect pockets. Called the Rule-Wallet, it is furnished empty and is designed to hold any pocket slide rule of conventional make. It sells for around $4.00. Remco Products.

47—BIN TILTER for low headroom locations

The Pullover Tote Tilt—a discharge mechanism for company's Tote Bins—is available both as a screw and gravity discharge mechanism. Relocation of the air cylinder actuator to front of mechanism, rather than back, allows its use without increasing

headroom requirements—important in plants with low headroom requirements. Tilt is designed to eliminate chance of lift truck damage to gaskets and has added advantages of permitting a gasketed dust-tight seal between Tote hopper and surge hopper into which it feeds. Unit, including sealing gaskets, remains in fixed position while Tote Bins—serving as shipping container, storage unit, discharge hopper—make contact with gaskets and hopper. Tote Systems, Inc.

48—NYLON TUBING for high pressure fluid service

Now available in a wide variety of diameters and wall thicknesses on an "off-the-shelf" basis, this nylon pressure tubing is designed for applications in high pressure fluid and pneumatic service, and in "push-pull" applications where friction is a problem and lubrication impossible or impractical. Continuous lengths of nylon tubing from a minimum of 0.010 by 0.060 in. to a maximum of 0.280 by 0.500 in. available, Applications for

...discriminating buyers choose

FEEDRAIL

Crane & Hoist Electrification Systems

1. **Electrical Safety**—Heavy gauge steel housing encloses copper bus bars, track-supported trolleys with positive polarization and uniform contact pressure, and every other provision making an electrical system safe and fool-proof is incorporated.

2. **Personnel Safety**—Metal enclosure protects plant and maintenance personnel. No dangerous bar conductors and accident-causing broken wires, trailing or strung cables.

3. **Dependability** – Rugged, precise construction, pays dividends in power continuity and maintenance—keeps cranes and hoists rolling!

4. **Adaptability**—Prefabricated runs may be of any length, straight or curved, with turntables, slide or tongue switches. Readily adaptable to suit changed conditions, every part re-usable.

5. **Compactness**—Single metal housing occupies less than half the space of open conductors or sheathed bars. Looks neat, too!

6. **Easy Maintenance**—Replacement of parts is negligible. Any part can be replaced without interfering with the rest of the installation.

7. **Life-Time Use**—Never becomes obsolete! Assures power for the life of the crane or hoist. Outlasts other types of electrification.

8. **Low Installation Cost**—Nothing left to do on the job site but to connect units together—fast—because everything has been engineered to fit installation requirements. No special tools!

Information for you: Bulletins are available on Feedrail 60 Ampere Systems (90 Ampere Intermittent Service); 100 Ampere Systems (150 Ampere Intermittent Service); and Heavy Duty Systems of 225, 375 and 500 Amperes. See your local Electrical Distributor or write Feedrail, Department P-3.

Never Becomes Obsolete

ELECTRIC FEEDRAIL®

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.

125 BARCLAY STREET • NEW YORK 7, N. Y.

SPECIALLY QUALIFIED REPRESENTATIVES IN PRINCIPAL CITIES

For more facts circle 619 on Reply Card

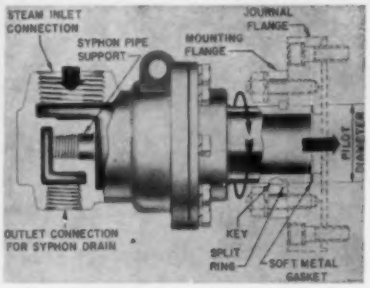
NEW PRODUCTS

(Begins on page 196)

the tubing include flexible cable casing, heater and vent control cable casing, wire cladding and fluid conductors. The Garlock Packing Co.

49—ROTARY JOINTS are easier to install

Improved convenience in installation and accurate control of concentricity are features announced for Type CF Rotary Joints. The design eliminates need for threaded connection of rotary sleeve, company says, which is some-



times difficult to disconnect from rotating drum journals after lengthy service, particularly in large size joints. Type CF has a machined straight rotating sleeve, in which outside diameter is held to close tolerances.

Attachment of joint to rotating drum, dryer, or roll is by a mounting flange keyed to rotating sleeve and drawn up against a spacing ring. Only an end wrench is required to draw up or loosen four nuts on mounting flange studs for installation or removal of joint. Joints come in 2-, 2½- and 3-in. sizes for 200 psi saturated steam or 400 psi cold working pressure. Also hot oil, under 100 psi, can be handled up to 500 F. Applications are anticipated in paper, rubber, chemicals, food products and general industrial service. Barco Mfg. Co.

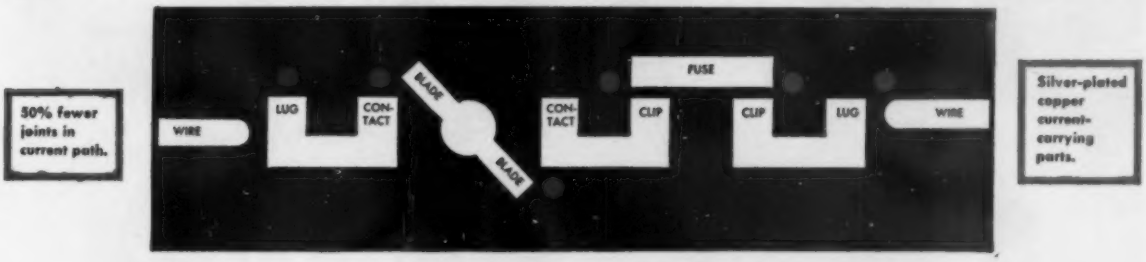
50—BLUE LINE PAPER promotes better drawings

Transblue 200T is a translucent, dry-developed diazo paper coated with light blue line sensitization which is not reproducible on other diazotype materials. The blue line serves only as a legible guide for the designer and does not obstruct actinic light and therefore does not reproduce. Any opaque image or line subsequently drawn in over the blue line will reproduce. Marginal information on original drawings may be printed in the non-reproducible blue line if it is not desired to reproduce this information. Transblue is claimed especially well

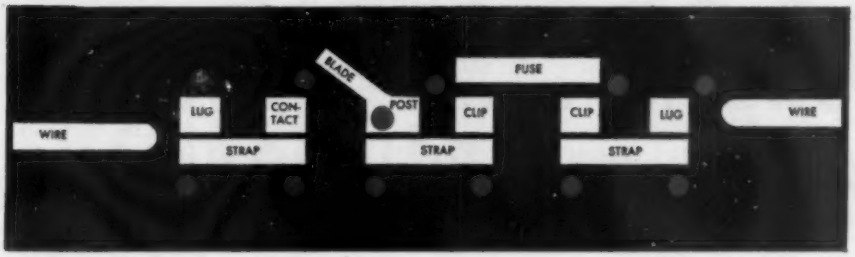
Why General Electric's new safety switches operate cooler, last longer...

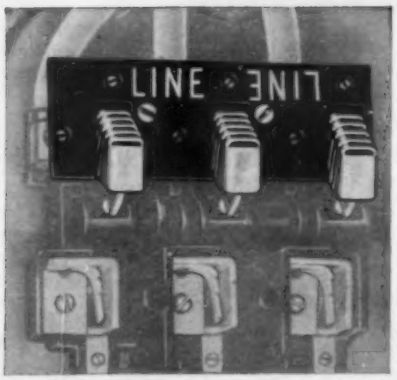
HEAVY DUTY LIGHT DUTY

NEW G-E CONSTRUCTION—ONLY 6 JOINTS (FEWEST POSSIBLE) IN CURRENT PATH (30-100 AMP.)



STANDARD CONSTRUCTION—NORMALLY 12 OR MORE JOINTS





STEEL ARC CHUTE contains arc, cools and extinguishes hot arc gases. (Included on all 600 volt and 100 to 600 amp. 240 volt switches.)

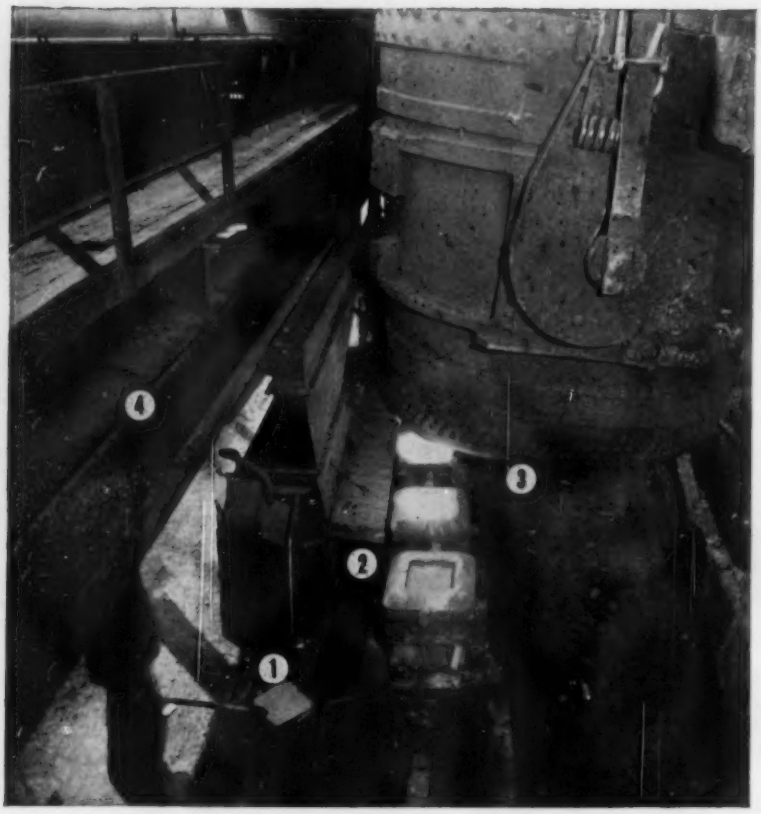
- Double-break action (30-100 amp.) splits arc for longer contact life and cooler operation.
- Blades reinforced with stainless steel springs maintain contact pressure.
- Heavy Duty switches feature Quick-Make, Quick-Break mechanism to reduce arcing and contact-pitting. Impossible to tease contacts.
- Light Duty switches have spring-accelerated make and break to prevent partial contacting.

Heavy Duty (Type A) switches sell at Normal Duty (Type C) price levels. Write for Bulletin CPD-74. See your nearest G-E distributor for a demonstration.

GENERAL ELECTRIC

Circuit Protective Devices Dept., Plainville, Conn.

For more facts circle 620 on Reply Card



Traveling fume hood follows the ladle...

for leaded steel production

AT JONES & LAUGHLIN STEEL CORP.

Toxic lead oxide fumes, inherent to the leaded steel manufacturing process, are now controlled effectively with a traveling hood car system (1), developed by KIRK & BLUM.

Orifice of exhaust system is just inches away from the pouring action (2). Toxic gas, formed in the ingot mold, is baffled by the ladle bottom, (3), to assist positive horizontal cross-flow at high velocity over the top of the molds.

The hood connects to a slotted exhaust manifold, (4), equipped with flexible sealing surfaces. Synchronized with the ladle crane, the car indexes freely along the pouring platform, opening the flexible sealing surfaces only at the point of contact to produce suction through the intake orifice for fume removal in the area of pouring.

This unique design is a product of KIRK & BLUM engineering ingenuity. Put this know-how to work for you. For further details or a no-obligation fume control survey, write: The Kirk & Blum Manufacturing Co., 3189 Forrer Street, Cincinnati 9, Ohio.

KIRK & BLUM.
DUST AND FUME CONTROL

50 YEARS OF SERVICE TO INDUSTRY

Pittsburgh, Pa. Distributor
The Bushnell Machinery Co., 3015 West Liberty Avenue

For more facts circle 621 on Reply Card

NEW PRODUCTS

(Begins on page 196)

suited for color separation, designing wiring diagrams and lifting out details from assembly drawings. Gzalid Div., General Aniline and Film Corp.

51—AIR CLEANER with a pneumatic oil lift

Model C POI Cycoil is announced as an oil bath filter with a pneumatic oil lift and no moving parts. It is designed to provide, in one unit, advantages of an automatic self-cleaning air cleaner with high efficiency and low maintenance requirements, along with reduced cost of installation and

maintenance. Major improvement over previous designs is the pneumatic lift, according to manufacturer—a simplified method of lifting oil from reservoir to perforated oil distribution plate, which in turn distributes oil to the pads. This replaces the motor-driven oil circulator used in company's previous models and eliminates need for electrical power. Other changes include a new cleanout door, addition of a "bullseye" gage to observe and help control oil level, and elimination of studs sticking out of the top of the unit. American Air Filter Co., Inc.

52—CARRY-ALL TRUCK for interplant delivery

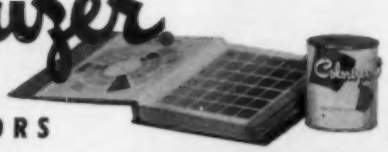
The Totemaster is announced as walkie-rider carry-all truck for use as interplant delivery or order selector truck. It can be furnished with 12- or 24-v electric systems and with

A SCIENTIFIC GUIDE TO THE USE OF COLOR in Industrial Plants

INCLUDING 36 FUNCTIONAL COLORS AND INSTRUCTIONS FOR THEIR USE

This Colorizer Functional Color Kit shows in precise detail how to use **color** in the plant—to promote morale and efficiency, better seeing, greater safety, and improved employee and public relations. Prepared by a nationally-respected color authority, the kit includes a full-color brochure illustrating the specific colors recommended for mechanical areas, wash rooms, cafeterias, drafting rooms, and exteriors. Also included in the kit is a group of Colorizer functional paint color standards—36 paint color chips identified by number and showing reflectance percentage of each. Colorizer Paints are available throughout the U.S. and Canada. Choose from easier-to-use Colorizer "Instant Paint" for interiors... highest quality enamels..., floor paints... wood finishes... long-lasting exterior finishes.

Colorizer PAINTS IN 1,322 COLORS



COLORIZER ASSOCIATES: **Bennett's,** Salt Lake City & Los Angeles • **Blue Ribbon Paint Co.,** Wheeling, W. Va. • **Walter N. Boysen Co.,** Oakland & Los Angeles, Calif. • **Brooklyn Paint and Varnish Co.,** Brooklyn, N. Y. • **James Bute Co.,** Houston, Texas • **Great Western Paint Mfg. Corp.,** Kansas City, Mo. • **Jewel Paint & Varnish Co.,** Chicago, Illinois • **Kohler-McLister Paint Co.,** Denver, Colo. • **W. H. Sweney & Co.,** St. Paul, Minn. • **Vano-Calvert Paint Co.,** St. Louis, Mo. • **Warren Paint and Color Co.,** Nashville, Tenn. • **George D. Wetherill & Co., Inc.,** Philadelphia, Penna. • **The Imperial Fin-Glaze Paints, Ltd.,** Toronto, Canada • **Jenson & Nicholsen, Ltd.,** London, England.

Industrial Section
Colorizer Associates
345 North Western Ave., Chicago 12, Ill.

As an aid to be used in specifying color, I would like to have your Functional Color Kit for Industrial Plants.

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Company _____

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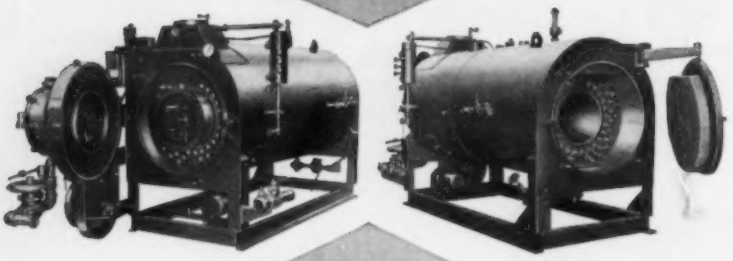
BEST BUY—PACKAGE BOILERS

Continental

2-PASS DESIGN...



sizes:
20 to 600 HP steam boilers—to 250 psi
hot water and HTW boilers
oil—gas—combination
oil/gas

These features show why Continental 2-Pass Automatic Boilers are your best buy for process steam and heating services:

- easier accessibility with hinged *front* door, davited rear door
- higher efficiency, longer life with *balanced* internal circulation
- no separation baffles as required with "excess" passes
- compact design saves valuable space
- uniform heating of boiler surfaces
- more efficient combustion, maximum heat transfer with spinning gas technique
- simplified design eliminates need for highly skilled personnel

The following Continental features give important savings and improved performance: forced draft, quiet operation, high quality steam, quick change dual fuel burner, easy installation.

Get complete facts on why the Continental 2-Pass Boiler means real savings in operation, maintenance and first cost . . . Write today for new Bulletin BE 400.

CONTINENTAL BOILER DIVISION
BOILER ENGINEERING & SUPPLY CO., INC.
Phoenixville, Pa.

For more facts circle 623 on Reply Card

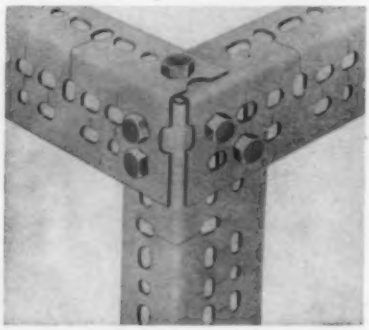
NEW PRODUCTS

(Begins on page 196)

overdrive for long fast hauls, in capacities from 2000 to 10,000 lb. Shelving is removable to allow larger packages to be carried, and unit can be furnished with seats on rear platform for use as personnel carrier. Lewis-Shepard Products, Inc.

53—STEEL FRAMING supports electrical equipment

Called the Right Angle Method, this line of slotted angle is intended for farming control systems, suspending conduit, pipe, ducts, trays and cables, and for structural support of electrical equipment. It is made of steel with a brightened, electro-galvanized finish. This corrosion-resistant finish permits



installations without regard for additional painting, but provides a good bonding surface for paint, if desired. It is produced in three sizes (the medium one is shown), to satisfy weight, strength and dimensional requirements of the job. Each has measure and cut marks spaced at ¾-in. intervals with a special mark at 3-in. intervals. Hole-and-slot patterns are repeated on 3-in. centers with markings for cutting. This framing is designed for interchangeable application in all sizes within the same structure and with other makes of slotted angle. A portable cutting instrument with centering pin for exact cutting mark alignment is available. Steel City Electric Co.

54—PATCHING COMPOUND has high impact resistance

RIW Epo-Tox is announced as a highly adhesive, epoxy-type floor patching and resurfacing compound with impact and abrasion resistance five to six times as great as concrete. It may be applied in layers as thin as ⅛ in., according to company, and eliminates need for chipping, jack-hammering and preparation normally associated with floor repair. Compound consists of a blend of epoxy resins, mineral

new 1960 RLM Specifications Book

Brings you New and Upward Revised Standards

BUT

...remember this important fact, this new Edition Announcement emphasizes that RLM Specifications for industrial lighting units are not fixed Standards. They are Quality Standards that advance with the Industry and the Science of Illumination.

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OF BEING SURE

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LIGHTING QUALITY

RLM Standards are Product Quality and Lighting Quality Standards for Industrial Lighting Equipment. They are moving standards—they move upward with each advance in the art of illumination and with the technological advances for manufacture. That's why we have annual editions of the RLM STANDARDS SPECIFICATIONS BOOK. That's why the 1960 Edition, now off the press, should be in the hands of all who buy or specify lighting—and its quality specifications should be known to all makers and sellers of industrial lighting equipment. For your complimentary copy, mail the coupon today.

These TWIN QQ's to Industrial Lighting Success are guaranteed with all lighting equipment bearing the RLM Label. And again for 1960, there are new and revised STANDARDS! They include: **New Specs for 1500 MA HIGH MOUNTING FLUORESCENT units. Semi-Direct Porcelain Enameled and Aluminum units. • GROUNDING of all component parts. • CONTINUITY OF GROUNDING throughout a continuous row. • SILVER PLATED CONTACTS in all "rapid start" units. • NEW SYNTHETIC ENAMEL Specification for component parts cover (1) rust inhibiting undercoating (2) adhesion (3) hardness.**

RLM STANDARDS INSTITUTE, Inc. Suite 8313, 326 W. Madison, Chicago 6, Ill.

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R-706

Choice of the wise buyer who compares...

CM HOISTS

CM METEOR ELECTRIC WIRE ROPE HOIST ½ to 5 ton capacities—Compact, enclosed design. Low headroom. Continuous duty motor with thermal overload protection for heavy duty service. Precision bearings and helical gears for long life. Only 110 volts at push button control. Hook suspension; plain, geared or motor driven trolley.

CM LODESTAR ELECTRIC CHAIN HOIST—⅛ to 2 ton capacities—First truly heavy duty version of small electric hoist. ¼ ton model weighs only 51 lbs. Heavy duty self-adjusting brake, plus exclusive regenerative electrical braking. Upper-lower safety limit switches. CM-Alloy load chain. Single and three phase.

HAND OR ELECTRIC CHAIN OR WIRE ROPE
CM makes them all! So you can choose a hoist that's perfectly suited to your specific needs in a compact, rugged and safe CM design.
CM TROLLEYS AND CRANES

CM CYCLONE Hand Chain Hoist—¼ to 10 ton capacities—Easy to carry. One ton model weighs only 36 pounds. Made of tough aluminum alloy. CM-Alloy load chain. High efficiency. Lifetime lubrication.

CM PULLER—"The One Man Gang"—¾ to 6 ton capacities—Lifts or pulls at any angle. Lever handle operation Automatic load brake holds at any point. ¾ ton model weighs only 13 pounds and fits in a tool box. CM-Alloy load chain.

● **FOR OVER 75 YEARS,** Chisholm-Moore has offered hoist buyers the newest and most efficient designs, the most rugged construction, and the greatest number of valuable operating and safety features. CM hoists operate with a very minimum of maintenance. They give years of satisfying service.

Request catalog and name of local stocking distributor.

CM HOISTS

CHISHOLM-MOORE HOIST DIVISION
COLUMBUS McKINNON CHAIN CORPORATION
TONAWANDA, NEW YORK
REGIONAL OFFICES: NEW YORK, CHICAGO, CLEVELAND

In Canada: McKINNON COLUMBUS CHAIN LIMITED, ST. CATHARINES, ONTARIO

For more facts circle 625 on Reply Card

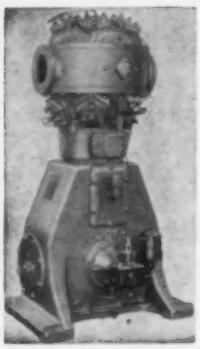
NEW PRODUCTS

(Begins on page 196)

aggregate, a catalyst and color, which combine in a chemical reaction. According to company, it can be applied in any required thickness without sacrificing impact and abrasion resistance. In addition to patching, it can be used for resurfacing concrete, wood, metal, quarry or glass tile. Other advantages claimed are resistance to acids, alkalis and solvents, quick-setting application. Toch Brothers.

55—VERTICAL COMPRESSOR for ratings to 150 hp

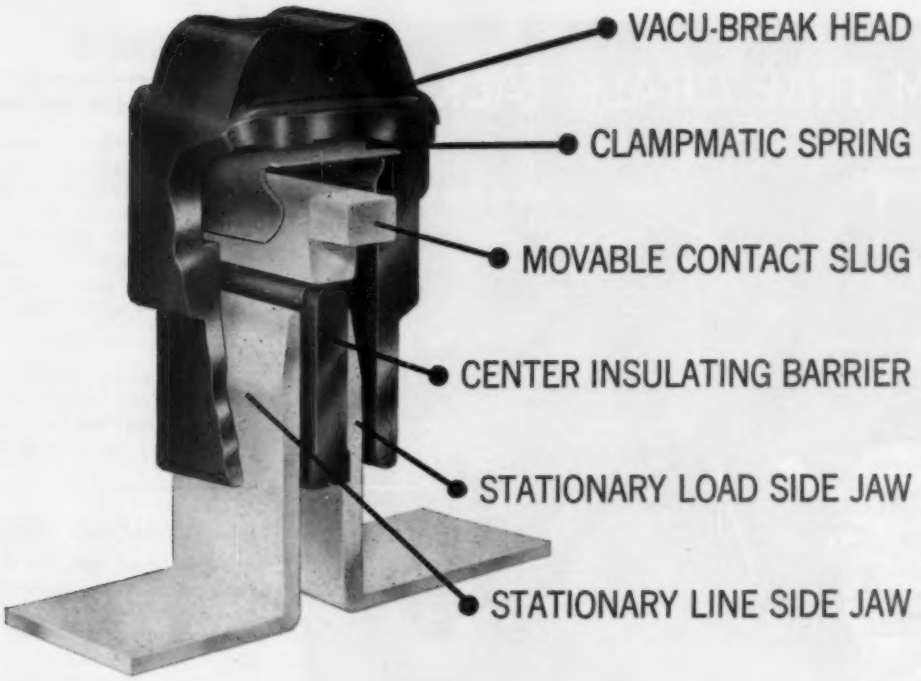
The WG-9H is a vertical, single-stage compressor with piston displacements from 633 to 1630 cfm, maximum pressures to 125 psi and horsepower



ratings to 150. This addition to company's line of heavy duty air, gas boosting and oil-free compressors gives three basic single-stage compressor models and increases the number of sizes to 20 which include 5, 7, and 9-in. piston strokes. Bulletin GG-5H gives details. Joy Mfg. Co.

56—PLUG VALVE silently throttles the fluid flow

Aeration, cavitation, surging, vibration and the resultant noise, associated with rapid flow of fluids, are claimed to be virtually eliminated by the Silent Valve. Flexible in size and scope, this valve can be supplied for installation in systems with line sizes from 1 in. to many feet in diameter, handling a variety of fluids. Heart of the valve is a cylindrical plug of elastomer having a large number of axially aligned holes which serve as flow passages. This plug is contained in a tubular housing between two perforated plates, one of which is either hydraulically or mechanically actuated to compress the elastic insert. As the plug is compressed, flow passages are reduced in diameter thereby throttling the flow. At full compression, these channels are closed and shut-off attained. Use



INCREASED SWITCH LIFE WITH CLAMPED PRESSURE CONTACT AND VACU-BREAK ARC CONTROL

You get longer switch life from BullDog safety switches, thanks to unique BullDog design. The high-tension Clampmatic* spring puts pressure where it belongs—on contact faces after the switch is "ON." This clamped pressure action assures good electrical contact for the life of the switch. It means the switch lasts longer, too, for there's no overheating to damage switch components. In switching "OFF," the pressure's removed before the "break" . . . providing true quick-break action.

Vacu-Break* design is another reason BullDog safety switches last longer. Switching contacts are completely enclosed in the Vacu-Break head. Arcs are restricted, starved of oxygen, cooled and smothered quickly. In addition, Vacu-Break *double*-breaks the circuit, effectively reducing the arc length and arcing time.

Vacu-Break arc control plus clamped pressure contacts add up to long switch life . . . and dependable, economical service for you. You'll find BullDog safety switches need little or no maintenance over years of heavy-duty use. See your BullDog products distributor.

FOR SAFETY'S SAKE—BUY VACU-BREAK!

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
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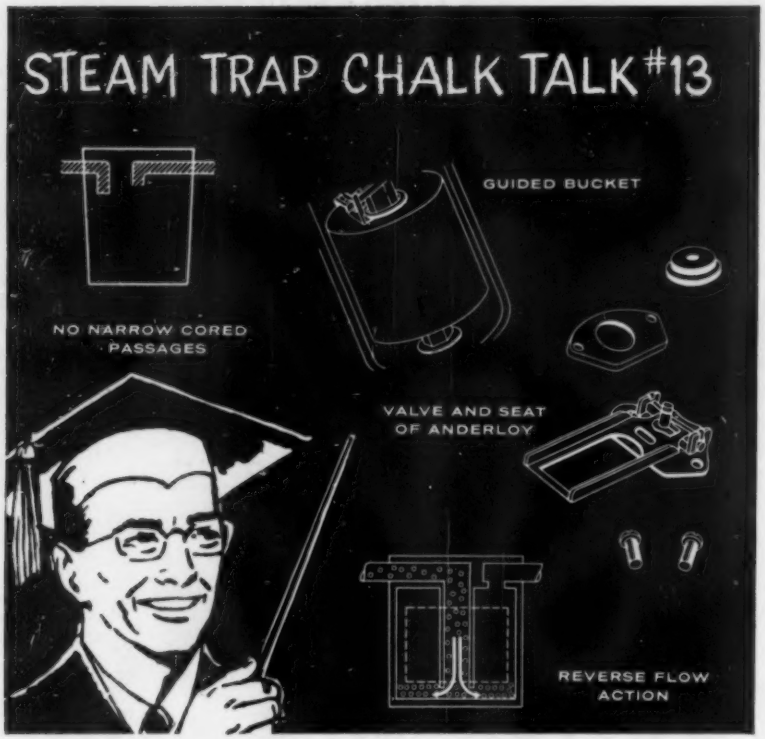
In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

For more facts circle 626 on Reply Card



Engineered Features of Super-Silvertop Steam Traps Assure Trouble-Free Operation

For trouble-free steam trap operations, with engineered, maintenance reducing features, install Super-Silvertops. First, there are no narrow cored passages to become clogged or to limit the flow. Second, a patented center tube guide arrangement of the bucket assures positive seating—keeps all parts in proper alignment. Third, valves and seats are made of Anderloy, an alloy developed to resist corrosive action. And fourth, reverse flow feature keeps the bucket stationary even under heavy loads, cleans trap of sediment and dirt. Send coupon for Bulletin #26, giving sizing details of these remarkable trouble-free traps.

A TRAP FOR EVERY PURPOSE

THE V. D. ANDERSON COMPANY
division of International Basic Economy Corporation
1939 West 96th Street • Cleveland 2, Ohio

Please send without obligation your Bulletin #26 giving sizing details.

Name_____ Title_____
Company_____
Address_____
City_____ Zone_____ State_____

ANDERSON SUPER•SILVERTOPS

For more facts circle 627 on Reply Card

NEW PRODUCTS

(Begins on page 196)

of a large number of small-diameter flow passages permits energy associated with large pressure drops to be dissipated smoothly by fluid friction within the tiny channels, it is explained, and dynamic underpressures are virtually eliminated from the throttling. Aerojet-General Corp.

To receive product data circle item numbers on the handy Reader Service Card provided on pages 271-272.

57—DIAMOND DRILLS have air and electric drives

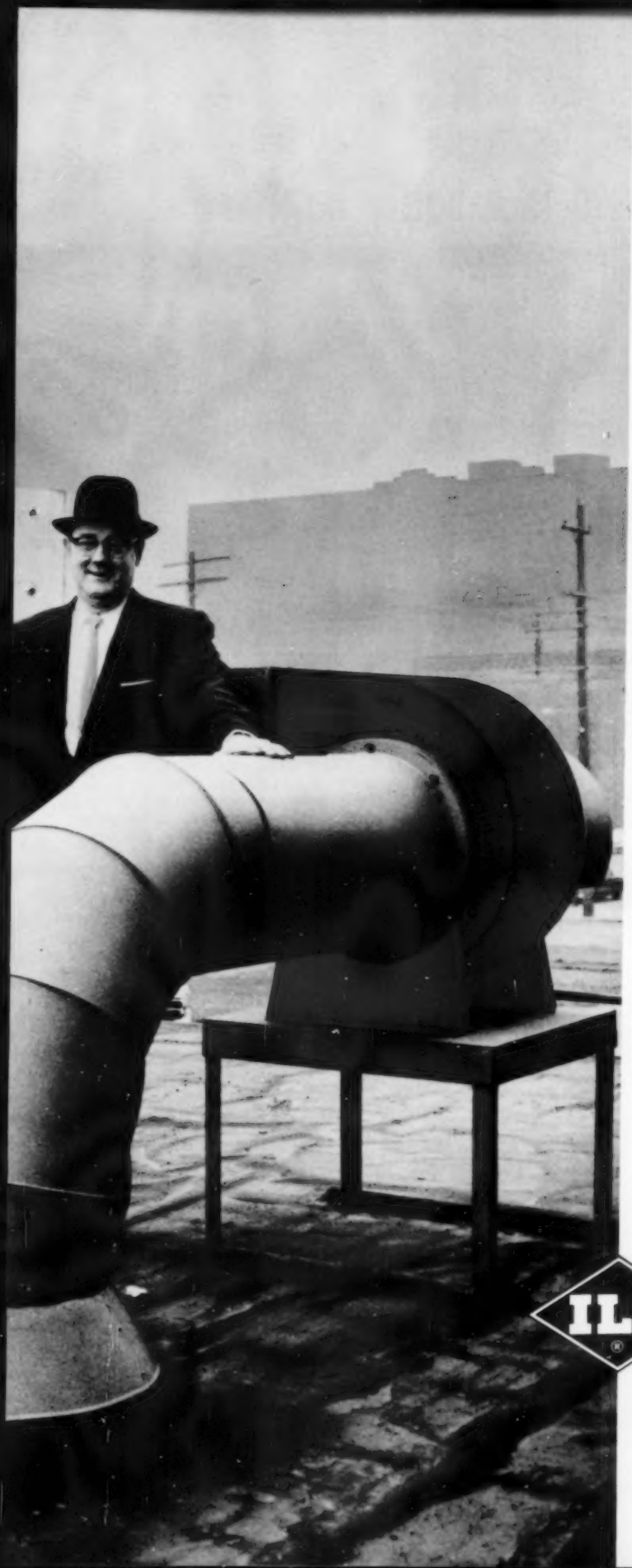
Optional, interchangeable air and electric drives are features of these two industrial diamond drills, both of 6-in. capacity. Model 330 (shown with air motor) is a swivel drill, for drilling holes at any angle through reinforced

concrete, brick, tile, or stone. It swivels in two directions, raises and lowers on a column attached to its base or can be taken off its base and mounted on a column or horizontal crossbar. The mechanical advantage of the screw feed head lets operator apply necessary bit pressure with only moderate force on hand crank. Model 305 is a lightweight vertical hole drill. For horizontal drilling, the screw feed mechanism can be removed from the base and anchored to the wall. Air motors (350-1500 rpm, 60 cfm, 90 psi) and electric motors (350-1000 rpm, 110 v) are all interchangeable. E. J. Longyear Co.

58—COUNTER counts shaft revolutions up to 1000 rpm

For controlling machines subject to processing variations, the Atcotrol Series 307, a miniaturized, shaft-driven revolution counter requires only 1¼ oz-in. torque. Repeatability

For more facts circle 628 on Reply Card →



"It would have paid us to put this fan in our system long ago"

John B. Stetson Co., Philadelphia

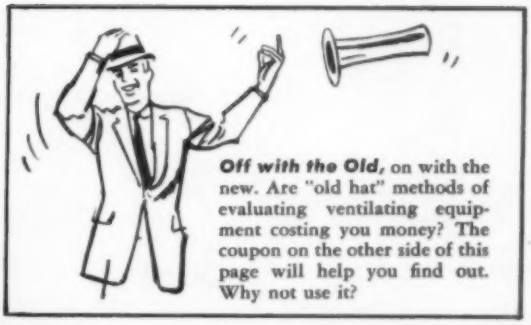
"Production went up . . . employee complaints went down immediately . . . when we modernized the ventilating system in our lacquer bake and dip rooms with Ilg equipment," says A. B. Jordan, Superintendent of Straw Hat Division, John B. Stetson Co., Philadelphia.

"This Ilg all-aluminum *airfoil* centrifugal pulls heavy fumes off the floor . . . exhausts them to atmosphere . . . makes life easier for the men who dip our straw hats in lacquer before baking them in ovens.

"Another Ilg direct-connected *airfoil* centrifugal fan recirculates air through a heating coil in our bake room and *maintains desired temperature to within 1° F.*

"In 2½ years since we remodeled our ventilating system, we haven't spent a cent for maintenance . . . or lost a minute's time."

"It would have paid us to put Ilg fans in long ago."



Off with the Old, on with the new. Are "old hat" methods of evaluating ventilating equipment costing you money? The coupon on the other side of this page will help you find out. Why not use it?

ILG®

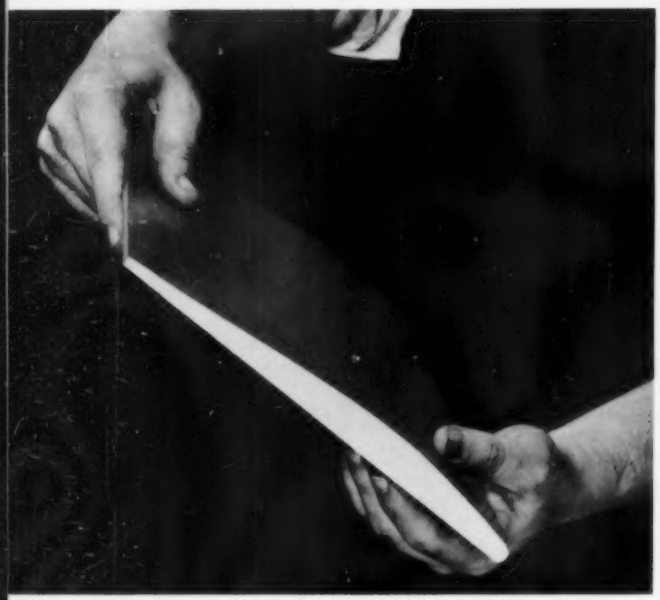
ILG ELECTRIC VENTILATING COMPANY

2832 N. Pulaski Road, Chicago 41, Illinois

Offices in more than 57 Principal Cities

Member of Air Moving and Conditioning Association Inc. (AMCA)

Want to know why an ILG® all-aluminum airfoil centrifugal is a better buy?



Backward Is Forward. Ilg backward curved *airfoil* blade design—the greatest step *forward* in fan design in 40 years—eliminates eddy currents and turbulence to assure quieter operation, undergo less drag and shock loss than blades of uniform thickness. Sound tests prove these fans can run at greater speed than older types—*with no increase in sound level.*

Smooth Air Intake. Ilg centrifugal fans feature large air intake area with gently curved inlet contours that assure smooth entry of air. No bearings or bearing supports to hamper intake air flow. Both direct-connected and belted types available. Standard construction is suitable for Class I, II, III operation to 9" static pressure.

"Old Hat" Methods of evaluating ventilating equipment can cost you money. To make sure that *your* present ventilating equipment is operating to your best advantage, clip and mail the coupon below.

Perfect Balance. Every Ilg-built centrifugal fan wheel—with backward curved *airfoil* blade design that eliminates eddy currents and turbulence—passes dynamic balancing "check-out" tests before being direct-connected to 3-phase or permanent-split capacitor single-phase motor.

Ilg Electric Ventilating Company
2832 N. Pulaski Road
Chicago 41, Illinois

Please send me your free folder "Are 'old hat' methods of buying ventilating equipment costing you money?"

Name .....

Title .....

Company Name .....

Address .....

City ..... Zone ..... State .....

ILG ELECTRIC VENTILATING COMPANY

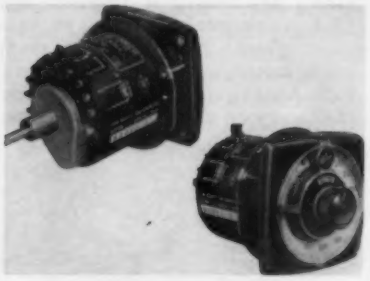
2832 N. Pulaski Road, Chicago 41, Illinois

Offices in more than 57 Principal Cities

Member of Air Moving and Conditioning Association Inc. (AMCA)

(Begins on page 196)

is given as ±0.0025 of dial range. With its clutch energized by external momentary or sustained switch contact, the counter is designed to indicate revolutions of a machine drive shaft until a predetermined dial setting is reached, tripping the heavy duty SPDT control contacts. An en-

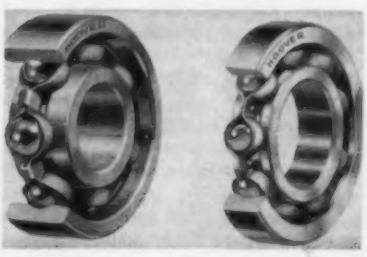


closed gear train reduces number of input shaft revolutions to a single turn representing full dial scale.

Once adjusted to range, the dial setting remains fixed for repeated operation providing automatic control for measurement of textiles, tapes, wire lengths; for product counting; for fluid metering; for conveying feeding etc. The counter is available for a-c or d-c operation with 11 dial ranges from 0-12 to 240,000 revolutions, and in numerous circuit arrangements. Automatic Timing & Controls, Inc.

59—BALL BEARINGS in inch and metric dimensions

One of two new series of ball bearings, the R series (shown at right) is designed to facilitate shaft and housing design because all boundary dimensions—bore, outside diameter and width—are made to inch dimensions. These bearings are compact and proportionally similar to conventional extra light and light series metric bearings. They come in 15 sizes for shafts from ⅛ to 1½ in. diam. The 30 series (left) is intended to meet the need for extra-small metric ball bearings for use with shafts and housings of small diameter. Bores range from 4 to 9 mm diam. All of the new bearings may be obtained



One **RUGGED** Swivel Construction * for a whole range of **CASTER DESIGNS**

. . . assures dependable, low-cost materials handling

The 900 Series Caster and its variations—featuring *2 full rows of ball bearings* rolling in *2 separate, hardened enclosed raceways*, for easy swiveling, heavy gauge steel horn and top plate for extra strength—are examples of the variety and scope of the Faultless line. Whatever *your* material handling problem—Faultless, the "Complete Line" backed by nearly three-quarters of a century of caster-making experience, assures you the Caster to best do your job.

Faultless 900 Medium-Heavy Duty Caster

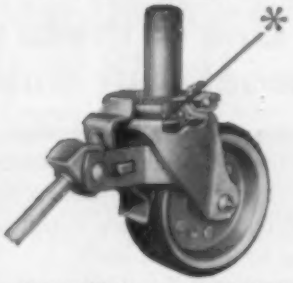
The 900 Series is a rugged, all-purpose Caster with Double Ball Bearing Swivel that out-performs the ordinary kind. Full drawn steel horn formed for surplus strength. Complete selection of wheels to suit floor surfaces, loads and operating conditions make it the ideal choice for use wherever high quality Industrial Casters are needed for medium-heavy duty applications.

Faultless 900GS Caster with Triple Grease Sealed Bearings

Dirt Can't Hurt It!

900GS combines dependable Faultless Double Ball Bearing Swivel construction with triple grease seals to give positive protection to swivel and wheel bearings wherever dirt, steam, chemicals are encountered—minimizes "down-time." Choice of hard and cushion tread wheels in sizes and capacities from 240 to 650 lbs. per caster.

Faultless C900 Scaffold Caster with Double Safety Locks



Protects Workers on Mobile Equipment

C900 Scaffold Caster combines an easy-to-use foot-operated brake lever which simultaneously locks both swivel and wheel and famous Faultless Double Ball Bearing Swivel construction—assuring safe and positive handling of mobile equipment holding workmen—making it the ideal caster for industrial, military and construction equipment.

WRITE FOR FREE LITERATURE

ASK YOUR DISTRIBUTOR Your nearby Faultless Industrial Distributor maintains a substantial inventory of Faultless Casters for immediate delivery. He and one of the strategically located Faultless Sales Engineers are available to work with you on every handling problem in your plant. Both are listed in the phone book Yellow Pages, under "Casters," and the Faultless heading.

Faultless Caster Corporation
Evansville 7, Indiana

Please send information on the following casters:

☐ 900 Series ☐ 900GS Grease Sealed ☐ C900 Scaffold

Name _____ Title _____

Firm _____

Address _____

City _____ Zone _____ State _____

For more facts circle 629 on Reply Card

One of these sling chains will meet your most exacting needs

One-day delivery is forthcoming when you specify ACCOLOY KUPLEX Sling Chains. Made up locally by an authorized KUPLEX distributor, these slings feature matched components which have been proof-tested at the factory at twice working load limits to assure their being as strong as the chain itself.

Factory-built all-welded construction is assured when you buy ACCO *Registered* Sling Chains. Registration ring and certificate—signed by ACCO—attest to the successful test performance of the sling.

See your local distributor for ACCO *Registered* or ACCOLOY KUPLEX sling chains. If by chance he does not carry the sling you want, write our York, Pa., office for further details.

ACCOLOY KUPLEX

• Available in 6 chain sizes (¼" to ⅞") in single, 2-leg, 3-leg and 4-leg styles. Assembled from Shaped Master Link, Drop Forged Kupler and Hook, ACCOLOY 125 chain.

ACCO Registered®

• Factory-built with ACCOLOY 125 chain. Chain is welded under scientific control and heat treated to optimum strength levels. New Shaped Master Link withstands deformation under heavier loads.

ACCOLOY KUPLEX SLING CHAINS

ACCO Registered® SLING CHAINS

ACCO

American Chain Division • American Chain & Cable Company, Inc.

Bridgeport, Conn. • Factories: *York and *Braddock, Pa., *San Francisco, Calif.

Sales Offices: *Atlanta, Boston, *Chicago, *Denver, Detroit, *Houston *Los Angeles, New York, Philadelphia, Pittsburgh, *Portland, Ore. *San Francisco

*Indicates Warehouse Stocks

For more facts circle 630 on Reply Card

NEW PRODUCTS

(Begins on page 196)

open or shielded. Those in the 30 series may have a single or double seal. Bulletin 112 gives details. Hoover Ball and Bearing Co.

60—PORTABLE NIBBLER has safety advantages

Model AN Nibbler is described as a 12-lb air-powered tool that packs a 2-ton punch. It incorporates many safety factors and is designed to provide maximum operator protection. It operates on a punch and die action;

sheared pieces of metal drop down and are not hurled upwards, to avoid possibility of eye injury. Also, it is designed to make it impossible for the operator's fingers to come in contact with the punch. Being air-powered, this nibbler can be used in critical areas, such as oil refineries and chemical plants, where torches and electric tools are prohibited.

The nibbler comes in five styles; each can be used as a portable cutting tool or vise mounted for bench work. Cutting capacity is 3/16-in. copper, brass, aluminum, 10-gage stainless steel and 8-gage mild steel at a minimum radius of 6 in. An adapter may be fitted for cutting a 3-in. radius on 12-gage stainless steel, lighter metals. Fenway Machine Co.

61—PLUMBING TOOL cold-draws tees from tubing

The portable Pipemaster Tee Turner is designed to cold-draw a "tee" from copper tubing within 5 min. It is announced as reducing the need for tee fittings and the number of soldered joints at each tee from three to one. Available for both water distribution and drainage systems, this tool can be used on a variety of tube sizes from 1¼ to 4 in. and including DWV, M, L and K.

In operation, the tool forms a tee in three steps; the copper tube is

locked into a clamp; a pilot hole is cut; a forged spinner is inserted and turned until the copper wall within is pushed upward and tee is formed. No heating or pre-treatment is required. Because of its flexibility, the Pipemaster Tee Turner can be used on installed lines without disassembly. Tests are reported to disclose that the tee formed from the original tubing can withstand liquid pressure greater than 1000 psi and tensile strengths greater than the tubing itself. Erie Tool Works.

62—LIFT TRUCK, mastless, heavy capacity unit

This new version Elbolift, gas operated and electric driven, is announced as providing a mastless industrial truck which obtains maximum fuel efficiency and economy plus being capable of moving heavy steel coils in and out of boxcars and stacking

120 in. high. Electric power is supplied to the drive motor through a variable voltage generator coupled to a gas engine. The stand-up, end control unit is said to perform all functions required of an industrial truck in steel mill or heavy duty operations, while offering driver safety and convenience. It incorporates swept-back transparent plastic guards, and a gate type guard to protect against backing into protruding objects.

Power unit of this truck is a four-cylinder F-162 Continental engine that slides out of the compartment on roller channels. It can be operated from straight gas or LPG fuel. The gas-operated, electric driven Elbolift

Cable-Laid Slings have the Flexibility of Manila Rope, the Strength of Steel!

• Cable-Laid Slings are the most versatile wire rope slings ever made! Flexible...strong...resistant to kinking...free from crankiness—they offer a unique combination of advantages that make them the solid favorites for any lifting application where ease of handling is all-important. Many users report Cable-Laid Slings cut rigging time in half, while others say they outlast standard slings 3 to 1!

The secret of Cable-Laid Slings is in the construction of the wire rope—a combination of six individual wire ropes, not strands, laid around a special steel center. Result: Cable-Laid Slings won't kink—even when used on heavy loads with square corners.

Galacco coating keeps Cable-Laid Slings clean and bright, gives them maximum resistance to corrosion. Patented DUALOC endings double-lock sling ends for double security.

And, of course, Cable-Laid Slings are *Registered* Slings. This means that each sling is proof-tested at twice the load-carrying capacity for which it is rated. Then, and only then, does it receive the ACCO tag and certificate of registration.

Get the details on Cable-Laid from your nearby distributor—or write us at Wilkes-Barre, Pa., for **Folder DH-532** giving strengths and weights on a full range of Cable-Laid Slings.

ACCO Registered
WIRE ROPE SLINGS

Wire Rope Sling Dept. · American Chain & Cable Company, Inc.
Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn.
In Canada: Dominion Chain Company, Ltd., Niagara Falls, Ontario

ACCO

For more facts circle 631 on Reply Card

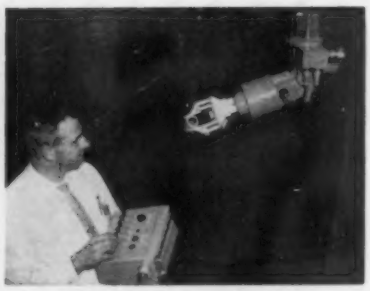
NEW PRODUCTS

(Begins on page 196)

is built in capacities from 15,000 to 20,000 lb. A battery powered model has capacities of 12,000 to 25,000 lb. Automatic Transportation Co.

63—MANIPULATOR, low cost, electro-mechanical

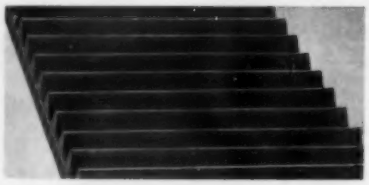
Model 100 is announced as an economy class electro-mechanical manipulator for small industrial and other laboratories—a remote-control, powered unit in the price range of master-



slave manipulators. It is designed to let an operator work from a remote, shielded location and perform high-precision tasks inside a sealed radioactive area. Viewing may be by closed circuit TV or through a lead-glass window. The device is reported to handle loads up to 200 lb and is equipped with a portable control console. General Mills, Inc.

64—CONVEYOR BELT carries objects up inclines

Dur-A-Lift Belt is designed for carrying objects up an incline as steep as 45 deg, and some objects to 50-deg incline. It will convey smooth, rough or slippery objects without sliding, company says. Top cover consists of parallel, transverse, inverted V-ridges of wear-resistant Dulon, making it more resistant to abrasion, gouging, tearing and oxidation. Deep V-ridges



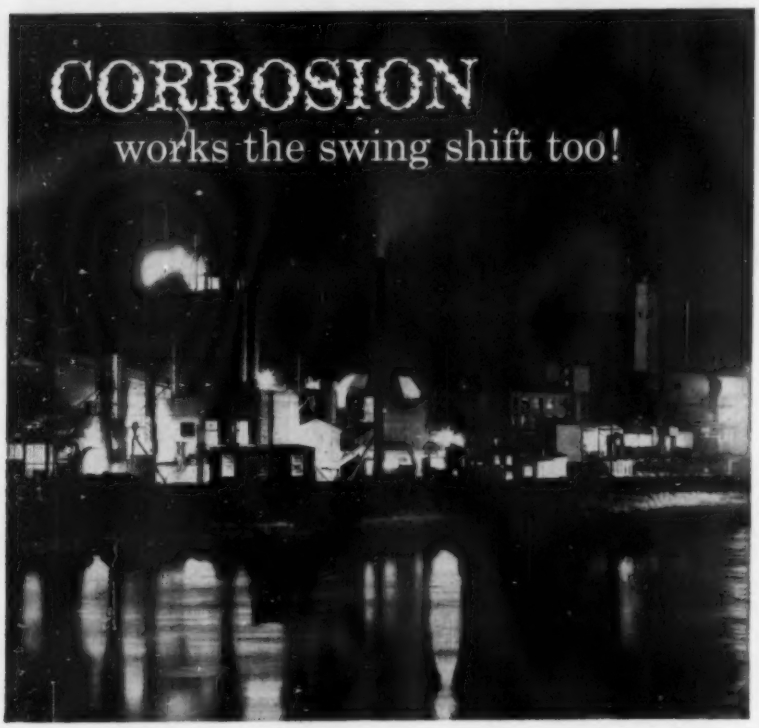
are self-cleaning, and afford grip action. Balanced belt construction equalizes ply stress so that each ply pulls its full share of load. Belt is available in three- or four-ply 28-oz duck, and can be had in other constructions with molded edges, bottom cover, as well as in other fabrics up to 48 in. wide. Boston Woven Hose & Rubber Co.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 271-272. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

65—PIERCED SHEET increases screen life, throughput

Conidure is claimed to last up to three times longer than perforated metal for screening, recovering, or dewatering coal, aggregate, chemical solutions and similar solids-bearing liquids passing through gravity or centrifugal separators. Throughput efficencies are also said to be substantially higher. Conidure is made by a process in which trapezoidal holes are pierced in sheets of carbon or stainless steel, copper, brass or aluminum. Sheet thickness can be up to seven times hole diameters, which range from 0.004 to 0.099 in.

The working side of Conidure comes in several degrees of smooth-



Thousands of miles of underground pipe feed natural gas to factories . . . other pipelines distribute oil and other petroleum products. And every foot . . . every inch . . . could corrode and leak anytime, day or night.

Electro Rust-Proofing can assist in the big job of corrosion control. Assist with surveys, design recommendations and actual installation of corrosion control systems.

Even if you have your own corrosion engineering group, ERP can swing extra manpower and engineering experience onto rush jobs—supplement your own team on the special problems.

For full information on ERP Pipeline Corrosion Control, Write Dept. E-52.72.

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CABLE: ELECTRO, NEWARK, N. J.

For more facts circle 632 on Reply Card

For more facts circle 633 on Reply Card →

STEAM THE MODERN WAY

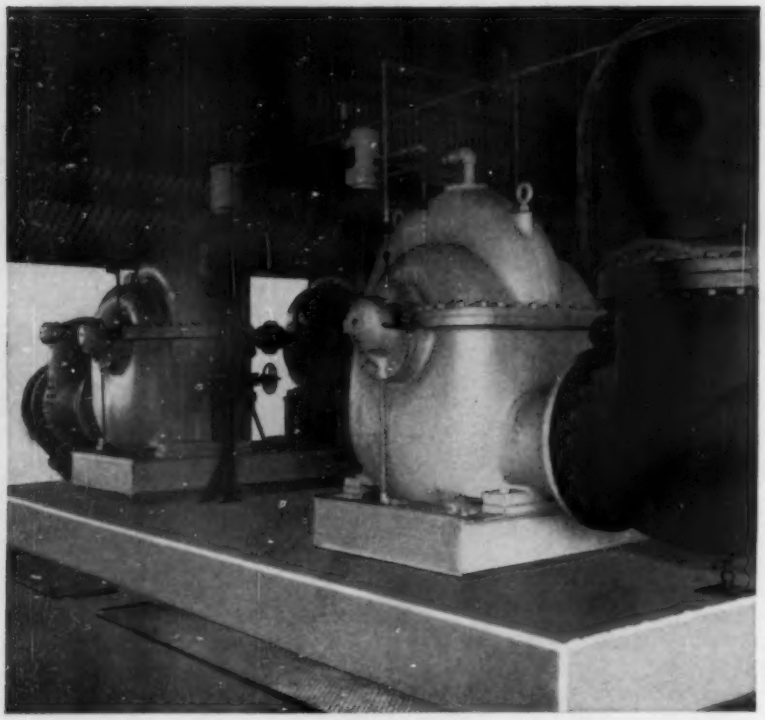
CLAYTON STEAM GENERATORS

Up in performance Down in size

Clayton

CLAYTON MANUFACTURING COMPANY

EL MONTE, CALIFORNIA • CINCINNATI, OHIO



the bigger your pumping problems... the better your reasons for giving them to ***WHEELER-ECONOMY***

St. Regis Paper Company did, at its Jacksonville, Fla., plant. The Units you see here are two Wheeler-Economy 30" x 24" Horizontally Split, Double Suction Pumps. They deliver 20,000 gpm each against a 60' head, to a surface condenser and several barometric condensers.

At C.H. Wheeler you can get help on large pumping problems that cannot be exceeded anywhere in scope and thoroughness. For example, Wheeler has one of the world's largest and best-equipped Pump Test Laboratories. Accurate scale models of complete circulating water intake tunnel structures for industrial power plant installations are built and tested in this Laboratory.

A full-staffed Engineering Department and modern manufacturing facilities are also available here. See your representative or write direct for expert advice on any pumping problem.

Economy Pump Division

C. H. WHEELER MFG. CO.

19th and Lehigh Avenue • Philadelphia 32, Pa.

Whenever you see the name C.H. Wheeler on a product, you know it's a quality product

Centrifugal, Axial and Mixed Flow Pumps • Steam Condensers • Steam Jet Vacuum Equipment • Marine Auxiliary Machinery • Nuclear Products

For more facts circle 634 on Reply Card

WOW! This is the third Anchor bolt I've had to move! Some body's going to PAY for this
Hold Up Boy! You're doing it the hard way! Haven't you heard about DECO ANCHOR BOLTS? They eliminate guesswork when you're setting... machinery.

SAVE TIME AND MONEY
...in your plant
...write to
Decatur Engineering Co.
519 EAST WILLIAM
DECATUR, ILLINOIS

For more facts circle 685 on Reply Card

NEW PRODUCTS

(Begins on page 196)

ness from unrolled to rolled flat with electrolytic polish. This side which has the smaller end of the tapered holes has humps that act in shovel-like fashion to guide material to the openings. Conidure is available in sheets up to 31 in. wide or formed into sheared shapes, cones, segments and cylinders. Cross Perforated Metals, National-Standard Co.

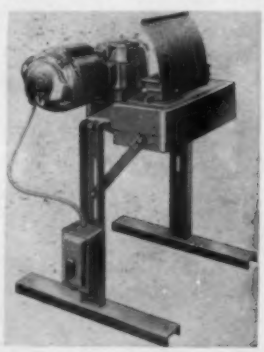
66—TOTE BOXES of rigid polyethylene material

Tough and strong, yet light in weight, these large tote boxes of rigid polyethylene are designed to resist boiling water, be steam cleaned and retain

their strength at low temperatures. They are made of inert material, resist acids, alkalis and degreasing solutions. Tray shown at right is stacking tray with moveable partitions, has vertical side walls for maximum capacity. Dimensions are 16 in. wide, 24 in. long and 7 in. deep. Tray at left will nest or cross stack. It's 17½ in. wide, 24 in. long and 8 in. deep. Forbes Products Corp.

67—SCRAP CHOPPERS grind up the press cuttings

These self-contained units chop skeleton scrap, as it comes from the press, into a size easily handled and stored for collection. Design and structural improvements have made possible a more positive cutting action, company



says, eliminating side motion of cutting blades, so that even thin hardened material may be chopped without blade spread. Helicoil inserts and back-up plates on cutting blades, and

TRAMRAIL TRANSFER CRANES *SYSTEMATIZE* HANDLING IN STEEL WAREHOUSE

The large storage area is completely covered by Tramrail crane service. Every item can be seen from the floor and readily reached with the two transfer cranes.

The Tramrail transfer cranes make it easy to place the long unwieldly pipes and bar stock into storage at any height. This makes for orderliness, which is an important factor in securing high operating efficiency.

A LARGE modern warehouse at Atlanta, Georgia, was designed to make use of overhead Tramrail equipment to enable the handling of large unit loads in and out of storage with the least effort and in the quickest time.

The principal storage section is provided with two parallel runways each having three tracks. On both runways is a 64-foot transfer crane that travels the length of the room. Cross-overs are provided, enabling a hoist carrier transferring from one crane to the other. This makes it possible to haul materials between any two points in the entire area without rehandling.

Steel is constantly on the move in this active plant. From 60,000 to 70,000 lbs. are brought in by railroad car daily and like amounts are shipped out. The material is unloaded from railroad cars at one end of the building and placed into storage. It is shipped out on trucks which are loaded at the other end.

The overhead crane system makes it possible to place incoming materials into allotted storage spaces at once. The need of storing temporarily in aisleways or other areas and extra handling which this entails is eliminated. Thus, the warehouse is kept orderly at all times and every item is readily seen and conveniently reached. Danger of handling accidents is minimized and overall efficiency is unusually high.

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CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
7581 East 284 Street, Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

For more facts circle 635 on Reply Card

NEW PRODUCTS

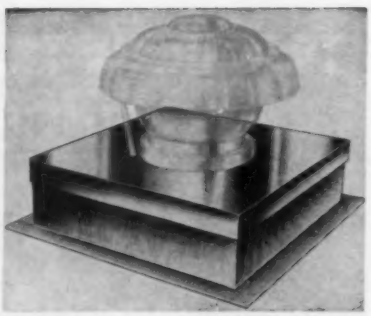
(Begins on page 196)

heavier, stronger main castings contribute to more rugged construction. It comes in three sizes with capacities in mild steel from 6 by 0.062 to 12 by 0.093 in. Cooper Weymouth, Inc.

68—SOUND CONTROL CURB is prefabricated unit

The Jenn-Air QT, designed to combine noise attenuation with negligible loss of air flow, is a prefabricated, self-flashing curb only 6 to 12 in. high. Tests are reported to show that it absorbs more than 90 per cent of an exhauster's sound power at inlet. According to manufacturer, use of this curb will permit direct overhead ventilation in installations where noise suppression is a critical factor.

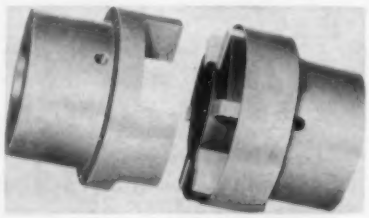
It is announced that, this curb produces a speed reduction equivalent to 43 per cent of actual speed—a 1725 rpm fan sounds as though it were turning at 980 rpm; reduces an exhauster's sonevalue (apparent loudness to human ear) by about two-thirds. It is claimed to eliminate



virtually all preceptible high frequency noise. Despite its effective attenuating ability, the QT reduces air flow capacity by only 10 per cent, company states; units rated at 1640 cfm deliver 1476 cfm when mounted on this curb. It is thermo-insulated to prevent condensation, and can be mounted directly at the roof line, or installed into the roof when lower contour is desired. Four sizes are available with or without cant strip. Full details are provided in Bulletin 60-SC. Jenn-Air Products Co., Inc.

69—FLEXIBLE COUPLING for heavy duty application

Model GH Flexible Coupling, for heavy-duty use, comes in sizes from 35 to 700 hp, at 1800 rpm, and for shafts up to 5½ in. diam. Consists of two metallic load cushions which provide a spring cushion for vibration,



shock loads and misalignment. It has removable individual inserts held in place by a steel collar to provide for inspection or replacement without disturbing driving or driven units. According to company, there is no metal to metal contact and no lubrication is required. Inserts are available. Gerbing Mfg. Corp.

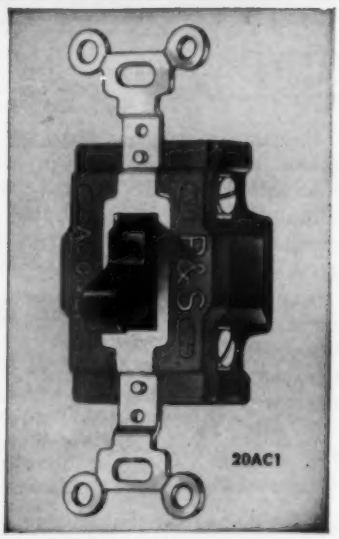
70—SOLDERING CREAM offers better performance

Fargail Soldering Cream is said to embody new discoveries in increasing activity of a flux without use of mineral acids while protecting the metal soldered from corrosive attack of the active ingredients. Jobs otherwise requiring strong liquid fluxes are reported simple and safe with this product—such metals as phosphor bronze being soldered as readily as tinned steel, galvanized iron, copper,

SPECIFIED
FOR RUGGED DUTY

OVER AND OVER AND OVER AGAIN

P&S
SUPER
AC
SWITCHES



- Extra large terminal screws.
- Back or side wired.
- Extra large silver buttons.
- Can be used to *full rated capacity* on inductive loads.
- Heavy plastic body.
- Contacts in upright position mounted at point of least vibration.
- Available in 15 and 20 Amp. types.

Send for complete catalog, Dept. PE-36.

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MAKE THE COMPLETE JOB COMPLETELY P&S
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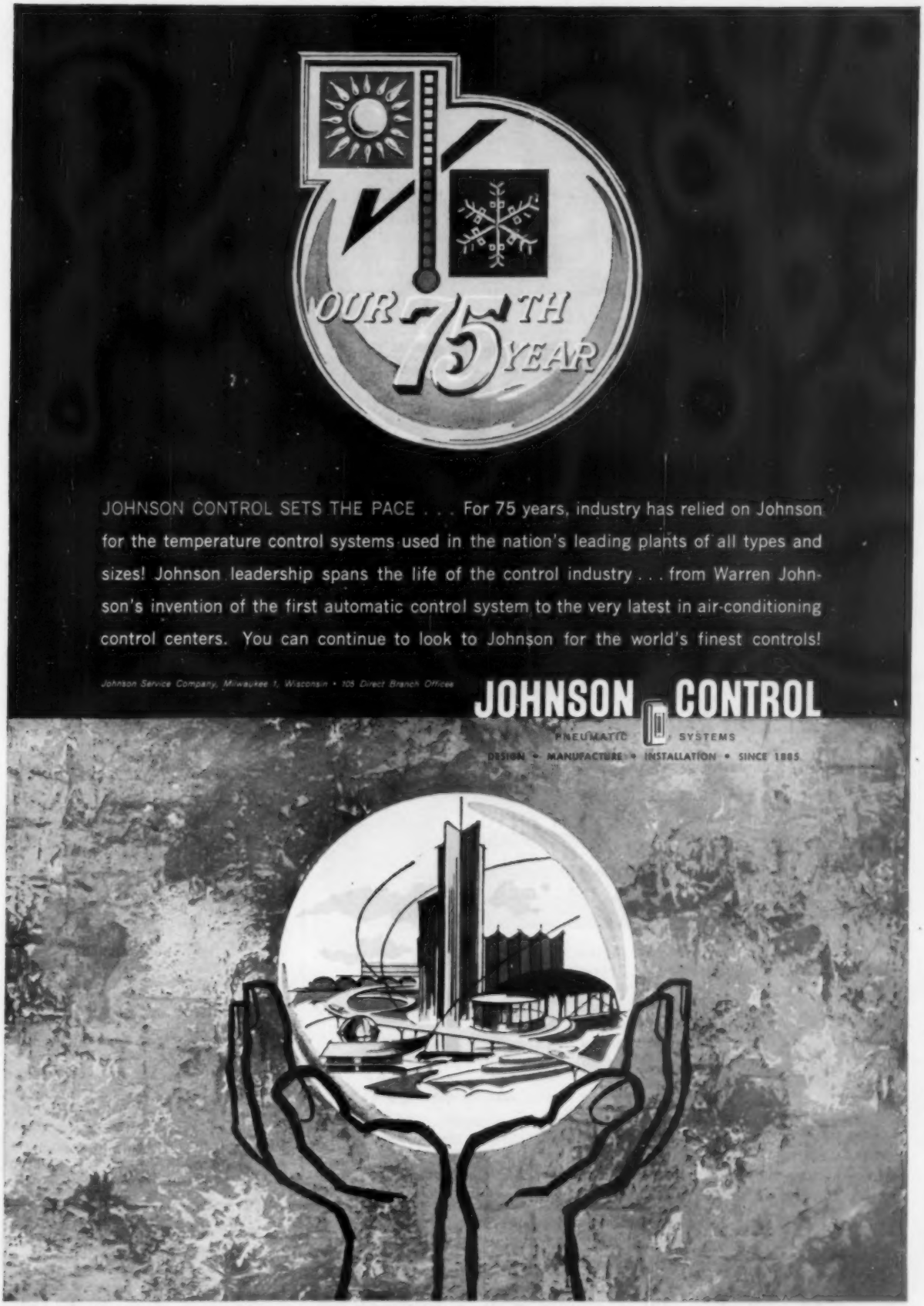
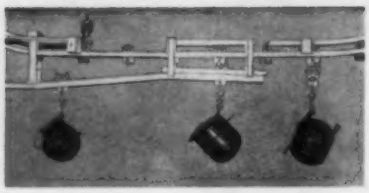

OUR 75TH YEAR
JOHNSON CONTROL SETS THE PACE . . . For 75 years, industry has relied on Johnson for the temperature control systems used in the nation's leading plants of all types and sizes! Johnson leadership spans the life of the control industry . . . from Warren Johnson's invention of the first automatic control system to the very latest in air-conditioning control centers. You can continue to look to Johnson for the world's finest controls!
Johnson Service Company, Milwaukee 1, Wisconsin • 105 Direct Branch Offices
JOHNSON CONTROL
PNEUMATIC SYSTEMS
DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

For more facts circle 637 on Reply Card

NEW PRODUCTS

(Begins on page 196)

brass. According to manufacturer, the soldering cream gives off no toxic fumes; it is buffered to reduce corrosion and may be used on all operations where a soldering paste is indicated. Its conductivity on electrical equipment is nil, company states, and it is effective when used for sweating copper fitting as its scavenging action is so produced that solder becomes highly fluid, making for tighter joints. Farrelloy Co.



71—PIGGY-BACK TROLLEY for overhead conveyors

These trolleys are intended to permit a single power conveyor to approximate the functions of a power-and-free system, at a much lower cost. Connected together and under power similar to standard trolleys, they are designed to pick up and carry other trolleys which carry the load. Thus, the loaded trolleys can be conveyed from one conveyor system to a second one, deposited on a side track for storage and then picked up again when needed. Controlled automatically, the two trolleys, traveling piggyback, can be separated where desired —the one under power continuing along the main track and the load carrying trolley moving along another track starting at the transfer point. The loaded one is then directed onto a side track area, work area, or to a point where it is automatically picked up by a second conveyor system or retrieved by the same conveyor. Econ-O-Veyor Corp.

72—FASTENER makes curtain walls go up faster

CW Topseal is announced as a self-tapping screw fastener permitting lower cost, speedier erection of curtain wall sections. Manufacturer points out that it replaces three separate fastening steps used in conventional methods. The three parts usually required are a bolt, nut and washer combination to fasten the interior sheet to the framing; a spacer bar to hold the insulation; and an additional fastener to secure the exterior sheet to the inside sheet. The CW Topseal is designed to combine these

three jobs in one. In lengths from 2½ to 4⅛ in., this fastener is offered in cadmium-plated Types 305 and 410 stainless steel. The fasteners work in combination with materials currently used in curtain wall construction, it is stated, including stainless or galvanized steel or aluminum sheets. Washers and cap nuts of the CW Topseal are furnished in colors to match building exteriors. (Threaded screw section of the fastener is made by Lamson & Sessions Co. from stainless steel supplied by Allegheny Ludlum Steel Corp.) Fabricated Products Co.

73—GAS DETECTOR is indication-alarm instrument

Probe-type Model 521, designed to give indication and alarm when gas concentrations reach unsafe levels,

POWERING

with Curtis compressors

DEPENDABILITY

DICTATES USE IN VITAL APPLICATION

New facility acts as high-speed communications headquarters for metropolitan fire and disaster control:

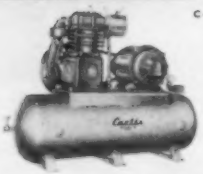
Architects: Hellmuth, Obata & Kassabaum

Consulting Engineer: John O. Falvey

NEW FIRE ALARM CENTER IN ST. LOUIS SELECTS CURTIS EQUIPMENT "TO RING THE BELL"

C-128

Curtis air compressors were selected for two different jobs in this just-completed "nerve center." By pressurizing cables that contain 1,172 miles of underground telephone and telegraph circuits, communications are protected against water or other damage. Another Curtis compressor powers eight cleaning jets located at key points inside the Center.



Full line of compressors available 1/4 to 50 H.P.

Your applications different? Probably—but the rugged dependability of Curtis compressors is the point that applies to your operations, too. All tanks meet ASME specification: units have Curtis-Seal Crankcase, Adjustable Timken Tapered Roller Main Bearings, Self Centro-Ring Oiling, Air Cooling (no cooling water required). Write for Free Catalogs covering the complete Curtis line.

THE COMPLETE LINE OF HORIZONTAL AND VERTICAL COMPRESSORS • AIR CYLINDERS • PENDANT AIR HOISTS

Curtis MANUFACTURING COMPANY

PNEUMATIC DIVISION • *DEPT. 46, ST. LOUIS 33, Mo.* • *Established in 1854*

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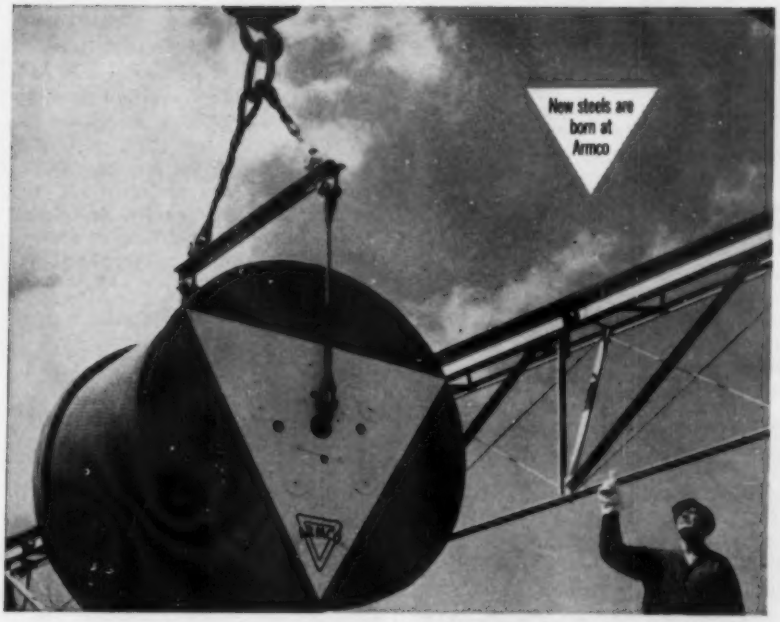


Tuffy is famous for "firsts"

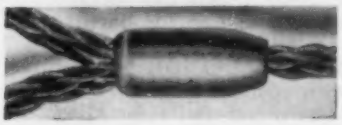
It's been that way for more than 30 years. Union Wire Rope started with an idea: that wire rope making should be a specialized field. And that the many different uses of wire rope needed specialized designs and constructions.

From that specialization have come many Union-developed "firsts." One of the most famous is the Tuffy line of patented 9-part machine-braided slings. The combination of extra strength and extra flexibility give you the ultimate in sling construction.

What does it mean to you as a sling user? Longer service life. Dependable operation. Greater safety. And ultimately the lowest cost sling you can buy, because of the extra service and efficiency.

Tuffy gives you these extras at no extra cost

Exclusive 9-part machine-braided fabric gives flexibility never found in any other sling. It's next to impossible to kink. If a kink should occur, it can be smoothed out easily leaving no damage.



Pressed-on metal ferrule gives the eye splice 100% of fabric strength. Applied under tremendous hydraulic pressure, it is also streamlined to eliminate projections and snags that might injure hands.

Get in Touch with Your Tuffy Distributor

Whether your sling jobs call for machine-braided Tuffy slings, or the new line of Union 6- and 8-part hand-braided slings, your Tuffy distributor is ready with the right item. Look him up in the Yellow Pages.

Tuffy® Tips
—on safe use of
Slings and Hoist Lines

Hoists vs. Hernia

About 75% of one manufacturer's compensation claims were connected with hernia — a common hazard in heavy lifting. Hernia claims average around $750. No need to stress the need for hoists instead of muscles for lifting tasks.

Hoist and Sling Safety Rules

1. Use a proper size hoist—not human backs and muscles—for every heavy lifting job.
2. Never use load chains as slings. Chain links break easily after distortion.
3. Use the sling that's right for the job. There's a Tuffy Sling for every purpose.
4. When loading slings with more than two legs: load a 3-legged sling as though it had 2½ legs; load a 4-legged sling as though it had 3 legs.

Use Tuffy Hoist Line

Tuffy Hoist Line and Tuffy Slings are the ideal team for efficient, safe hoisting at lowest long-run cost. The extra strength, toughness and service life we build into the Tuffys results in ultimate low cost.

FREE!
New Tuffy
Sling Handbook

All about slings from A to Z, including types, dimensions and rated loads. Address **Union Wire Rope Corporation, 2272 Manchester Ave., Kansas City 26, Missouri.** Specialists in high carbon wire, wire rope, braided wire fabric, and stress relieved wire and strand.

2

UNION Wire Rope

Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company
Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Southwest Steel Products

For more facts circle 639 on Reply Card

NEW PRODUCTS

(Begins on page 196)

can be operated as a portable instrument or as fixed indicator/alarm with up to 100 ft of cable to detector element. A built-in nickel-cadmium battery and charger provides for portable power. The unit can also be operated directly from 110 v, a-c. The indicator meter is calibrated in percent of lower explosion limit of desired gas. Adjustable meter trip provides alarm circuit for a built-in buzzer alarm. Auxiliary contacts are provided for external alarm or shutdown circuits. Also, an adjustable current meter serves to allow approximate classification of individual gas constituents in many gas mixtures.

The probe-type detector allows maximum flexibility, since tip position gives specific gas concentration at that point. Readings are instantaneous and automatic. The carrying case is small and light in weight; it stores two spare elements and the lid serves as a base for the detector if permanently located. Model 521 sells for approximately $430.00 Houston Instrument Corp.

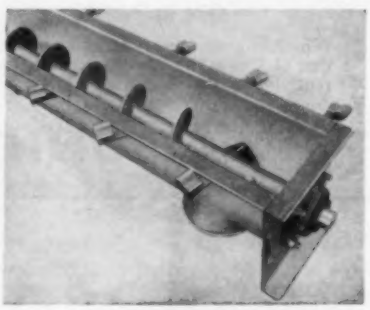
74—CONDENSERS designed to offset wind conditions

AAVC Turbaire Vertical Flow Air Cooled Condensers are horizontally mounted units designed to present a lower silhouette and offer less wind resistance and a lower pre-square-foot roof loading. They are rated at 5 to 100 nominal tons capacity. Seventeen sizes are offered, with those of 60-ton capacity and up being furnished as

double units manifolded together. Manufacturer claims that capacity ratings for the units are constant regardless of wind condiitons. Company's Turbaire fin design, embossed and spaced to increase the efficiency of heat transfer, is incorporated. Fins are aluminum with die-formed collars mechanically bonded to ⅝-in. OD seamless copper tubing. Quiet operations is achieved by use of four-blade deep-pitch fans, V-belt driven on permanently lubricated ball bearings. Acme Industries, Inc.

75—STEEL CONVEYORS for chemical, food industries

This line of stainless steel conveyors includes both helicoid screw (shown) and ribbon flight types with design features to meet sanitary requirements of chemical and food processing plants. Sizes range from 4 to 12 in. in diameter. Standard features include outboard mounted bearings with inboard removable mechanical seals or stuffing boxes; hinge, drop bottom troughs held in place by quick-opening clamps; top covers secured by pivoted U-type clamps or toggle



"A Few Hours Ago That Partitioning Wasn't There!"

Talk about *versatility!* You can use Phoenix Wire Mesh Partitions most anywhere . . . around general stores, stock rooms and tool rooms, or for departmental divisions, corridors and restricted areas. What's more, you can relocate Phoenix partitions as often as required by changes in plant layout. For they can quickly, easily be disassembled and reinstalled . . . oftentimes in a matter of hours . . . by a small crew of your own men.

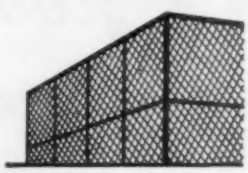
Wire mesh partitioning offers other important advantages, too. It's ideal where lighting conditions and the free flow of air must be considered . . . perfect where unit air conditioners or heaters are in use. They don't interfere with vision or sound . . . they don't obstruct fire extinguishing systems, either. It's the right answer in fact, to all partitioning problems . . . so write today for Bulletin #58.

SINCE 1885 ONE OF THE NATION'S LEADING MANUFACTURERS OF WOVEN WIRE PRODUCTS

PHOENIX WIRE WORKS, INC.

1958 E. KIRBY • DETROIT 11, MICHIGAN

Telephone: WAlnut 2-4520



For more facts circle 640 on Reply Card

Plexiglas glazing could have saved this replacement cost!

Have you checked the figures lately on your cost of replacing broken windows? Chances are that it is high, and here's a money-saving solution. Use PLEXIGLAS® acrylic plastic. PLEXIGLAS window glazing withstands impact, shock and vibration. It is lightweight . . . weather-resistant . . . easily installed. Call your nearest dealer for advice and service on clear transparent sheets or tinted and translucent colored sheets. He is listed under PLEXIGLAS in the Plastics section of telephone directories in major cities.

Chemicals for Industry

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

In Canada: *Rohm & Haas Company of Canada, Ltd., West Hill, Ontario*

CALL YOUR AUTHORIZED PLEXIGLAS DEALER

PROMPT DELIVERY • TECHNICAL ADVICE • FULL RANGE OF SIZES AND COLORS

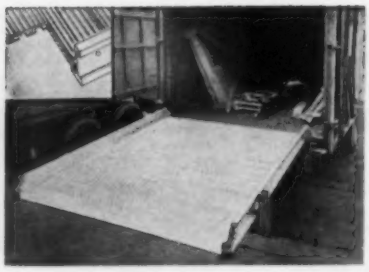
For more facts circle 641 on Reply Card

NEW PRODUCTS

(Begins on page 196)

clamps. Food grade hollow core and bead Neoprene gasketing is used to provide dust-tight operation. The Bucket Elevator Co.

76—DOCKBOARD made of strong magnesium alloy



The Whitelight Dockboard is construction of ZK60, a high strength-to-weight ratio magnesium alloy claimed to have more than twice the compression yield strength of many magnesium dockboard alloys, and its non-skid corrugated floor is made of integrally stiffened extruded interlocking sections. The rigid side rails provide a high curb for wheel confinement and are shaped to give a comfortable grip for lifting. Four long spacers can be adjusted to provide stability for a wide range of applications. The dockboards and bridges are available with standard and heavy duty curbing and flooring in 3½- to 10-ft lengths, 3- to 6-ft widths. Individual sections can be joined together. Whitelight Portable Equipment Div., White Metal Rolling & Stamping Corp.

77—PIPE INSULATION, lightweight, rigid foam

Unarco U-200 is announced as a lightweight, rigid, urethane-foam pipe insulation for use at temperatures from —300 F to 220 F. According to manufacturer, it has a K factor of only 0.14 at 70 F, and a density of only 2.3 lb per cubic foot, yet has high compressive strength. Claimed

unaffected by most mastics and sealers normally used for cold insulation, U-200 is described as self-extinguishing and having no capillarity, and very low humidity, water absorption and hygroscopicity. The product can be cut to size and shape with hand tools. It comes in half-round sections 36 in. long, as well as in block form. Fibrous Products Div., Union Asbestos & Rubber Co.

Reader Service Cards on pages 271-272 make it easy to get further information on any of these products. Just circle the item numbers of the products you would like to know more about.

78—TEST KITS of high visibility safety paint

Two "do-it-yourself" testing kits of Hi-Viz Fluorescent Industrial Safety Paint are offered to let plant engineers compare these paints with regular safety colors. According to manufacturer, Hi-Viz colors are up to four times brighter than the brightest non-fluorescent safety paints. Kit S-3 is de-

With an increase in business, the Interior Steel Equipment Co. has augmented their paint baking facilities. In doing this they have achieved economies in handling of work while maintaining and even enhancing the quality of their products.

They installed a Sly Convectioneered Oven, 45′ long, 9′6″ wide, 6′9″ high with semi "A" type sheet metal hoods at the exit and entrance ends to form an efficient heat seal. Beneath the oven is a self-contained 2,500,000 BTU per hour direct gas-fired heating unit.

As aids in achieving excellent finishes on the products are: (1) efficient air distribution over the work (2) temperature uniformity in the baking zone (3) correct exhaust conditions to maintain proper oven atmosphere, and (4) a low overall temperature gradient between supply and recirculation temperatures.

This installation is typical of the careful engineering that goes with all Sly Industrial Ovens. *May we discuss your requirements with you?*

Designers and Manufacturers of: Dust Control Systems, Blast Cleaning Equipment, Tumbling Mills, Industrial Ovens.

SINCE 1874 SLY

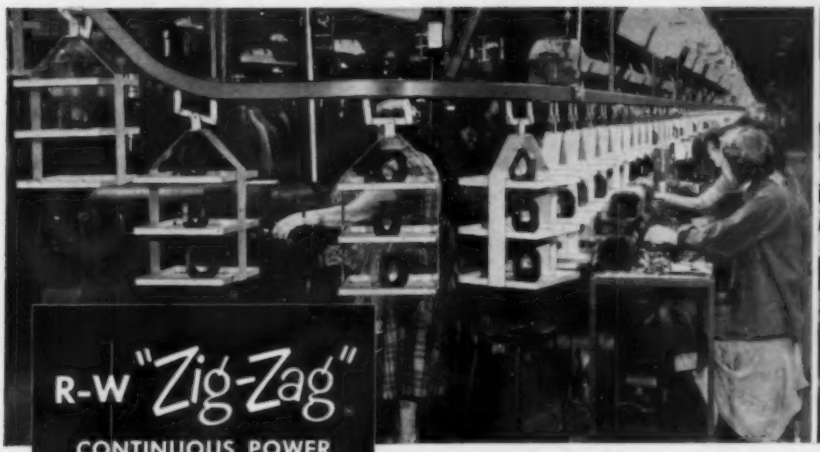
THE W. W. SLY MANUFACTURING CO.

4600 TRAIN AVENUE • CLEVELAND 1, OHIO
OFFICES IN PRINCIPAL CITIES

OVERSEAS LICENSEE: ANDREW AIR CONDITIONING LTD., LONDON S.W. 1, ENGLAND

For more facts circle 642 on Reply Card

At long production lines or individual work stations...

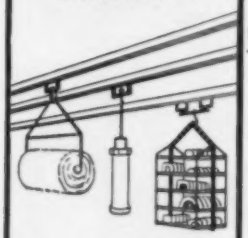


R-W "Zig-Zag" CONTINUOUS POWER CONVEYORS will save you TIME, LABOR and DOLLARS!

From electronic devices and TV Tubes that require "gentle" handling to wearing apparel, foods and rugged industrial products—an R-W "Zig-Zag" Conveyor offers a time and cost saving overhead materials handling system. Equally adaptable for small, special purpose conveyors or huge "door-to-door" plant-wide systems that convey components and products from receiving, through all production processes, finishing operations and on to shipping. "Zig-Zag" Conveyors offer a time-proven method of increasing production and lowering overall manufacturing costs.

CHECK THESE IMPORTANT "Zig-Zag" ADVANTAGES AND FEATURES

VERSATILE



... applicable to industrial plants, warehouses and commercial operations of all types and sizes—no matter how large or small. Efficiently conveys unit loads up to 125 lbs. of products, parts, components, etc. at speeds of one inch to 100 feet per minute ... the only conveyor offering a proven multi-speed drive unit.

FLEXIBLE

... in fact, the most flexible conveyor in its class. May be installed to move up, down, in, out and around. Ideal for all types of overhead materials handling ... efficiently and economically conveys products from receiving, to inventory through all production processes, finishing and finally to shipping. Saves time and costs "all the way."

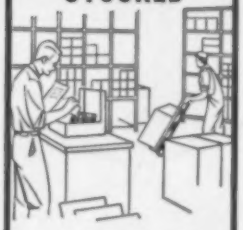
RUGGED

... furnished in one, top-quality grade ... inferior components are never substituted. "Zig-Zag" consists of a continuous chain of alternate horizontal and vertical wheel units which travels through a rugged steel track. Chain, track, power units and accessories are all "designed for each other" for years of dependable service and trouble-free operation.

RE-USABLE

... "Zig-Zag" systems may be changed, expanded or relocated with almost 100% re-usability. Economical to purchase and install ... plant personnel can easily "self-assemble," install and later relocate a "Zig-Zag" System. "Zig-Zag" will meet your needs now—and for years to come. May be later incorporated into an R-W "Twin-Trak" Automatic Dispatch System.

STOCKED



... in most metropolitan areas. Permits immediate shipment of all components for your "Zig-Zag" system. When necessary a complete system can be installed and operating in a matter of days. R-W's nation wide staff of factory trained, materials handling specialists are near by to take care of any service that may be necessary ... eliminates unnecessary downtime.

An R-W Sales-Engineer, at no obligation, will gladly survey your plans or facilities and submit a plan showing how "Zig-Zag" will best solve your materials handling problems. Write today for complete information.

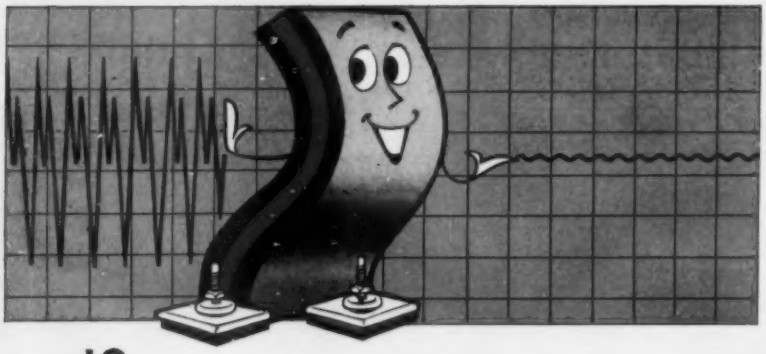
R W

Richards-Wilcox

MANUFACTURING COMPANY
MATERIALS HANDLING DIVISION

460 W. THIRD ST. • AURORA ILL. • Branches in all Principal Cities

For more facts circle 643 on Reply Card



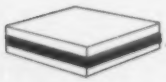
IS

VIBRATION

ROBBING YOU BLIND?

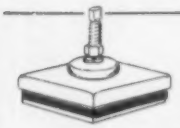
Transmitted vibration in your plant or office is a universal culprit that keeps attacking your costs and operating efficiency in a hundred ways . . . unless checked at its source.

Unisorb machine mounts — either pads or Level-Rite devices — reduce up to 85% of this transmitted vibration and provide a practical, low-cost solution to almost all vibration problems. Unisorb Vibration Control reduces noise, worker fatigue and human inefficiency. Unisorb will reduce maintenance of buildings and machines, cut down-time and simplify machine installation. In addition, tests show that Unisorb permits running machines at higher speeds and closer tolerances for increased production and improved quality.



Unisorb Mounting Pads
Unisorb pads are the basic vibration control unit, identified by the red centers and brand mark. Available in a wide range of densities and thicknesses for proper application. Saves up to 80% in installation time and costs.

Unisorb Level-Rite 200
Unisorb Level-Rite "Junior" has been especially designed for light machines, air conditioners, business machines and similar equipment. A low cost, precision leveling device and vibration control unit, with loading limit of 200 lbs. per unit. Ideal for original equipment.



Unisorb Level-Rite Mount
Unisorb Level-Rite is a universal, self-contained leveling device for all types of machines. Fast, simplified way to achieve and hold precise level. Available with exclusive screw-post design or as a basic mounting plate for use with built-in leveling devices.

Remember — to simplify installation, improve performance and control vibration . . .

UNISORB MOUNTS MAKE THE DIFFERENCE

. . . for all types of machines from laboratory equipment to giant presses.
Ask for a Money-Back Trial . . . Now!

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Please send me a Unisorb Sample and Free Book.

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FED-61

For more facts circle 644 on Reply Card

NEW PRODUCTS

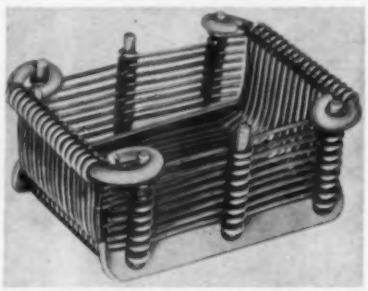
(Begins on page 196)

signed for spray application and holds three 16-oz aerosol cans containing white primer, Hi-Viz color and sealer. Kit S-20 contains all these plus quarter pints of all eight Hi-Viz

colors in alkyd enamel, white primer and Uvitron protective sealer. An application bulletin, price schedule and color swatches are included with both kits. This high visibility paint is suggested for use on fire protection apparatus, lift trucks, dangerous parts of machinery, elevator doors, low beams, emergency stop buttons. Lawter Chemicals, Inc.

79—FURNACE BASKETS made of molybdenum wire

Molybdenum baskets and trays for high temperature applications are fabricated without welds and feature looped wire cross rod design with slotted openings. Maximum open area of 50 per cent provides for faster heats and increased circulation of



atmosphere. The baskets are claimed capable of operating in temperature in excess of 3000 F, and to have the ultimate in strength to weight ratio. Bix Co.

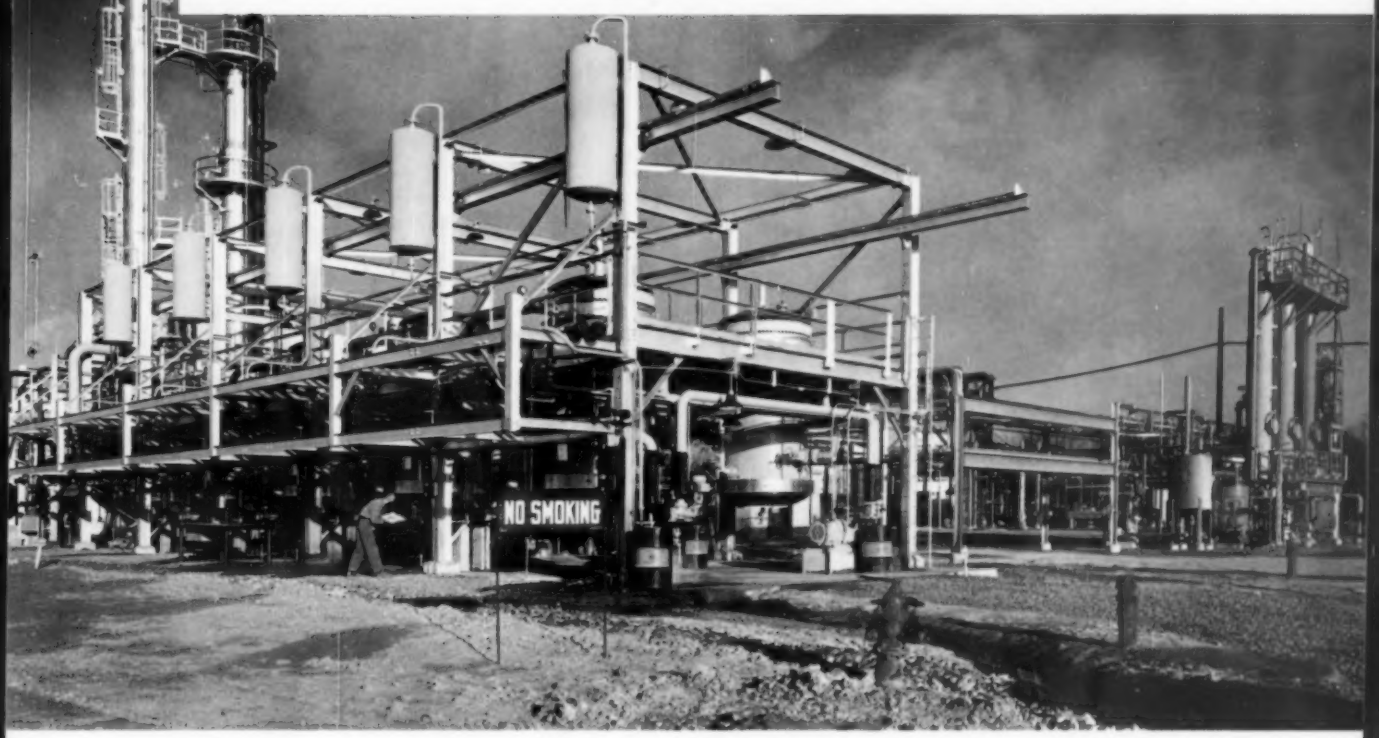
80—TRANSDUCER puts measurement into shaft position

The Dyna-Servo Transducer is a high-torque, electronic transducer designed to convert a measurement of pressure, liquid level, temperature, mechanical motion etc., into a shaft position for operating transmitting slidewires, alarm switches, analog to

For more facts circle 645 on Reply Card ——→

CORROSION PROTECTION

In Depth . . . With Color!



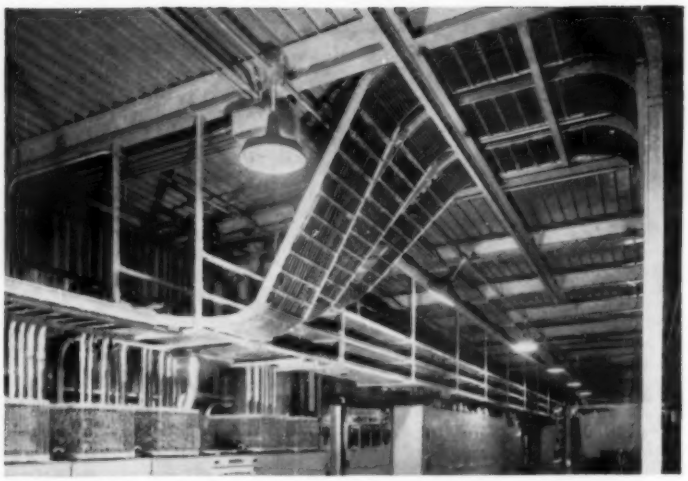
Wherever your plant and equipment are subject to critical acid, alkali or solvent exposures even at elevated temperatures, high humidity, severe weathering — or any combination of these — one of Truscon's corrosion control systems will provide maximum protection at lowest cost per square foot per year.

Truscon will also provide guidance in proper surface preparation, coating application, and inspection. For a detailed, written specification on protection of steel, iron, aluminum, concrete, and other surfaces, call the Truscon branch nearest you, or write Truscon Laboratories for specific information.

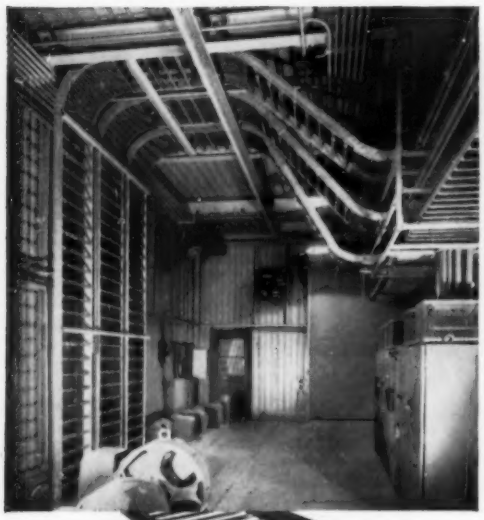
TRUSCON *Laboratories*

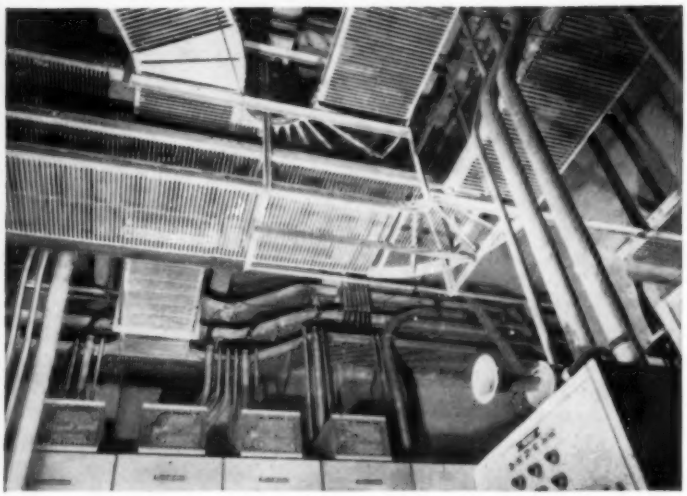
Industrial Maintenance Division of Devoe & Raynolds Co., Inc. • Detroit 11, Michigan

how INLAND STEEL uses GLOBE INTERCHANGEABLE TRAYS to support cables in their Indiana Harbor Plant

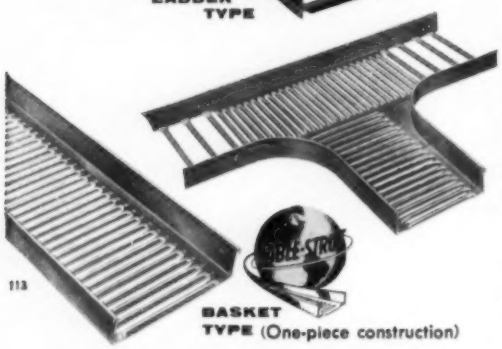


★ Engineered for Uniform Design and Easy Installation
★ Steel or Aluminum Construction
★ Complete Accessories for SPEEDIER Installation
★ Complete Interchangeability
★ No Sharp Edges to Damage Cables





LADDER TYPE



BASKET TYPE (One-piece construction)

Globe's two types of cable trays, one a ladder type and the other a basket type, to support cables, wiring and tubing have become increasingly popular because they can be used INTERCHANGEABLY at any given location depending on the type and weight of the cables to be suspended. The advantages of each type tray can be used to the fullest. Globetray, the ladder type, is intended for use where festooning is not a problem, while Cable-Strut, the basket type, is used for the support of communication wire, instrument tubing and control cables in automation applications.

These two cable trays have been thoroughly field tested in hundreds of large industrial installations, in new plant construction, in power plants and for power distribution in all types of manufacturing processes. Send for FREE catalog giving full information and installation techniques.

113

PRODUCTS DIVISION

THE GLOBE COMPANY Manufacturers since 1914

4016 S. Princeton Ave., Chicago 9, Ill.

Representatives in all principal cities . . . consult the yellow pages in your phone book under "Conduits" for the one nearest you.

For more facts circle 646 on Reply Card

NEW PRODUCTS

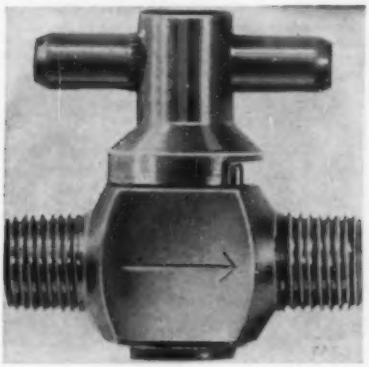
(Begins on page 196)

digital encoders, deviation contacts. The electronic balancing system uses an amplifier to operate a balancing motor which provides plenty of torque for precise positioning of encoder, slidewire contact or other device.

The sensing element may be a capsular or helical element or a differential pressure unit. Motion transmitted from the sensing element through a linkage positions the core of a differential transformer. The coil is repositioned through a mechanical feedback system to return the electrical system to balance. A pointer positioned by the shaft indicates the measured variable on a 3¾ in. dial. Remote readout can be had through the retransmitting slidewire (standard). Readout is any function of the measured variable, as determined by the type of cam used in the rebalancing system. Accuracy is given as ±0.25 per cent of span. The Bristol Co.

81—SHUTOFF VALVE for vacuum or pressure service

The O-ring principle makes the miniature Series 9500 Valve leakproof and easy to operate, says manufacturer, and repair can be made without removing the valve from the line. The T-handle is color-coded for gas or liquid service . . . oxygen, air, nitrogen, hydraulic fluids, water, oil. Typical



applications include instrumentation, hydraulic clamp, jacks. The valve has an O-ring on the cylindrical face of the straight plug to prevent leakage past the inlet port as well as the critical stem area. The handle position indicates the exact valve position and a quarter turn is all that's required from full open to tight closed position. The valve is available in brass or stainless 303 with male or female connections in ¼- or ⅜ in. size. Circle Seal Products Co., Inc.

82—DUST HOOD permits visibility, free hands

The moderately priced Microvoid is designed to allow full visibility and unimpeded movement of arms and hands for operations which must be performed under dust-free conditions. Manufacturer explains that a blower at the top forces room air into the dust hood through a large-area filter which removes airborne dust particles down to 0.5-micron diam and provides an internal positive pressure to prevent unfiltered room air from entering the open front of the Microvoid. Its working area is 34 in. long, 24

in. deep, 19¼ in. high. Of ¼-in. Plexiglas, hood weighs 35 lb. Prices start around $285.00. Air-Shields Inc.

KING SIZE?
choose
Logan
Hydraulic Cylinders
Any size, any pressure, any stroke, any mounting to meet your specific need. Our engineering staff will be glad to assist you in helping to meet your design problems.
Logan 750 series rotating and nonrotating hydraulic cylinders. Operating pressures to 750 psi.
MEMBER: National Machine Tool Builders' Assn. National Fluid Power Assn.
FREE.....
Send for your copy of A down-to-earth 20-page booklet on the "rights" and "wrongs" in setting up and servicing air and hydraulic equipment.
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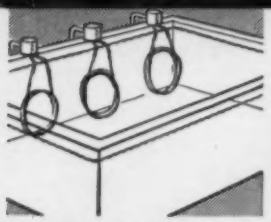
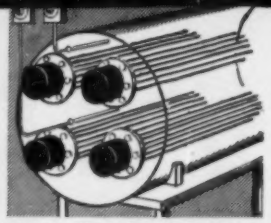
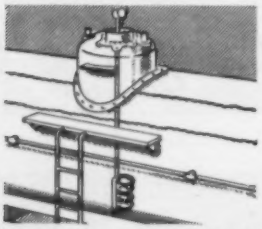
Call your CHROMALOX Man for heating answers



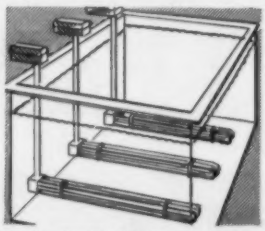
For plating applications, Chromalox CT Immersion Heaters are sheathed in lead, copper, stainless steel.



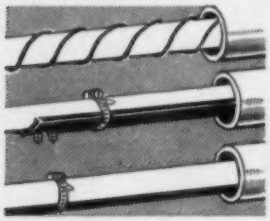
Water heating with TM flange-type Immersion Heaters mounted at one end of a tank.



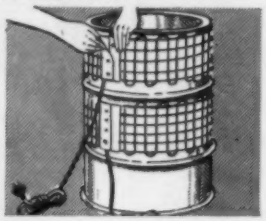
Heating viscous materials with BLCK Immersion Heaters before pumping from a railroad tank car.



Heating liquid held at constant level. TL Heaters generate heat parallel to the tank bottom.



Pipe heating with Chromalox Thermwire (300°F), Strip Heater (750°F) and Tubular Heater (1100°F).



Heat for 5- and 55-gallon drums. Just snap on and plug in. Protective coating resists abrasion, chemicals.

LIQUIDS? Only CHROMALOX heats so many things . . . so many ways

There's one best way to do any job. And you get the best results only by using that one best method.

Regardless of what your heating problems may be . . . your best chance of finding the best answer is to call your Chromalox Man.

- He represents more than 15,000 different types, sizes and ratings of electric heaters and heating elements . . . the world's largest line.
- He orders from the world's largest stock.
- And he is a *heating expert* . . . he understands your problem and can help you find the answer.

No matter what your heating problem is . . . solids, liquids or gases . . . call your Chromalox Man for the efficient, *electrical* answer. (*His phone number is listed at the right.*) Or, check the boxes below, write your name, title, and address at the bottom of this page and mail the coupon to us. Edwin L. Wiegand Company, 7500 Thomas Boulevard, Pittsburgh 8, Pa.

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Cypress 2-7016

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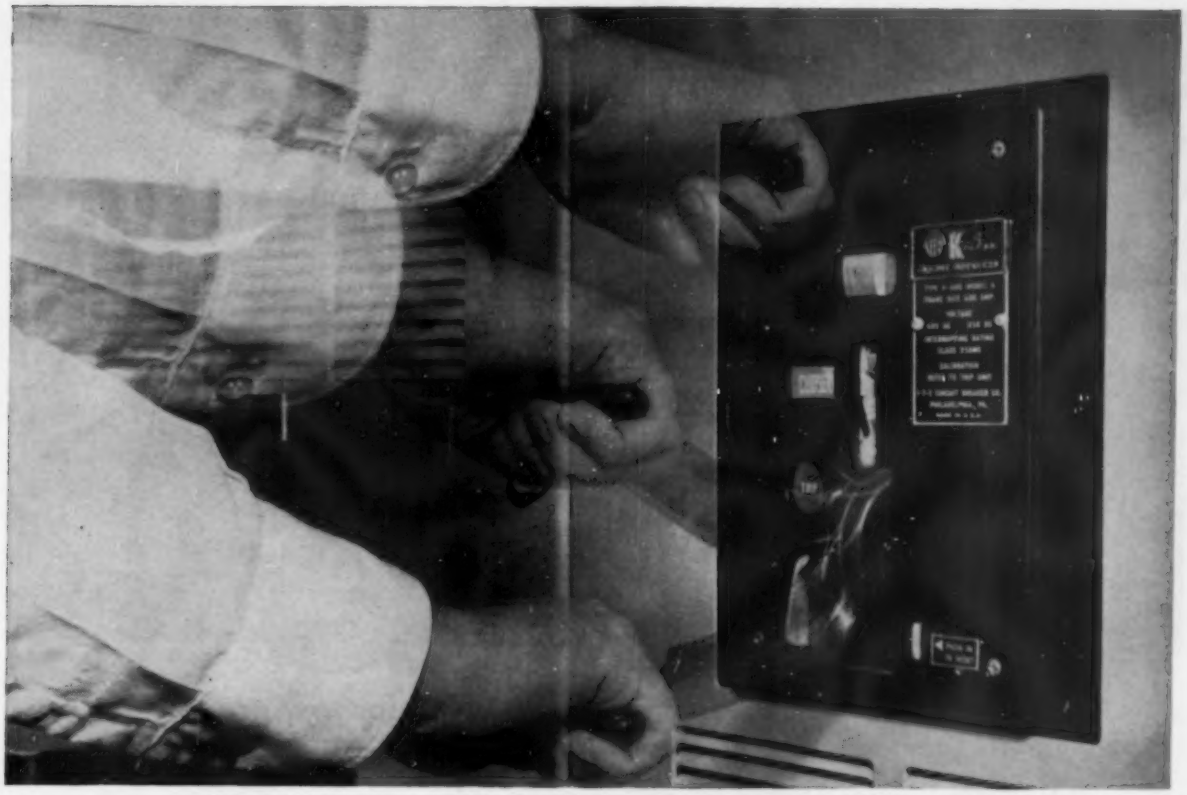

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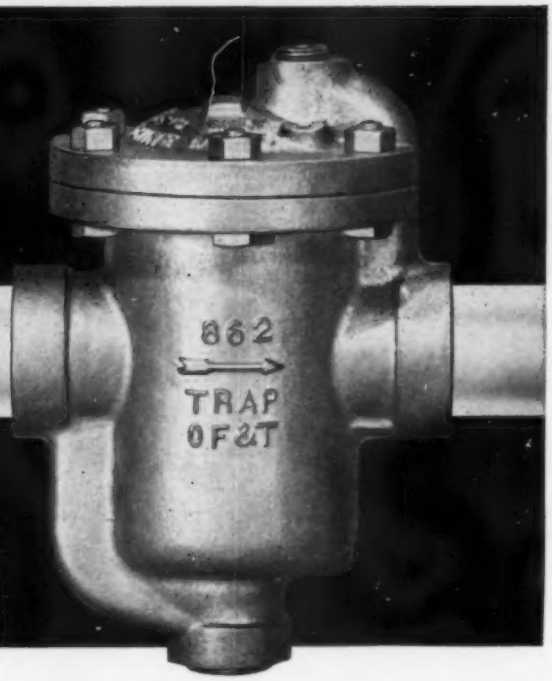
Here are the steam traps designed especially for heating systems . . .

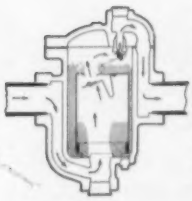


ARMSTRONG OPEN FLOAT AND THERMOSTATIC STEAM TRAPS

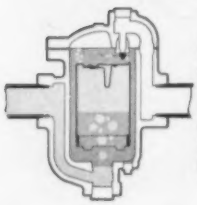
Engineered for low pressure intermittent service where large amounts of air accumulate while steam is off

Armstrong O.F.&T. Traps make it possible for heating systems to deliver the efficiency they were designed to deliver. They are ideal for low pressure unit heaters, preheat and reheat coils, converters, hot water generators, etc.

HOW ARMSTRONG O. F. & T. TRAPS WORK:



When steam is turned on, it pushes air through the wide open thermic vent and trap discharge valve at full differential pressure between supply and return lines. Condensate formed by incoming steam goes right through.



As steam reaches open float, thermostatic vent closes. Float fills with steam and rises to close trap valve. Residual air and CO_2 escape through fixed vent at steam temperature.

Advantages to the user:

BIG AIR HANDLING CAPACITY—Thermic vent handles large amounts of air in system when steam is turned on. Fixed vent handles normal air in system.

NO STEAM LOSS—Stainless steel valve is water sealed, is not damaged by dirt or scale, cannot develop steam leaks.

CONDENSATE AND AIR REMOVED AT STEAM TEMPERATURE—No opening lag.

LONG LIFE—All working parts, including open float, are stainless steel. Bodies and caps designed for 250 psig operation. Open float cannot collapse.

MINIMUM MAINTENANCE—Simple, proved design and high quality materials assure trouble-free service.

LOW COST—Mass production methods permit high quality at low cost.

EASY INSTALLATION—Horizontal straight-through pipe connections, conventional sizes.

UNCONDITIONALLY GUARANTEED—All Armstrong Traps are guaranteed to satisfy the user or purchase price will be refunded.

ARMSTRONG MACHINE WORKS
9126 Maple St. • Three Rivers, Mich.

BULLETIN NO. 775 BULLETIN NO. 801

Use the coupon at right to get these helpful bulletins: No. 775 describes O.F.&T. traps fully. No. 801 tells how to select traps for draining unit heaters including data on 30 makes of unit heaters.

Armstrong Machine Works
9126 Maple St., Three Rivers, Mich.

Please send me: ☐ O.F.&T. Trap Bulletin No. 775; ☐ Unit Heater Bulletin No. 801.

Name.....

Company.....

Address.....

City.....Zone.....State.....

For more facts circle 650 on Reply Card

New Plant Construction

(Continued from page 164)

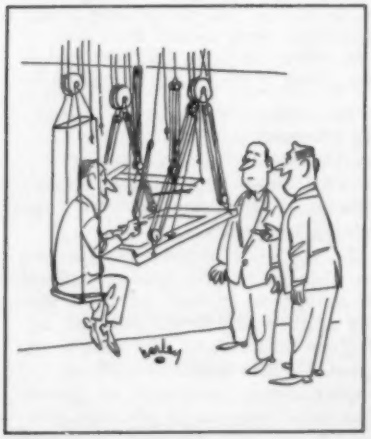
When completed, company will have a total of 315 modern coke ovens with a monthly production capacity of 160,000 tons.

Valley Forge, Pa.—Pennsalt Chemicals Corp., Philadelphia, Pa., plans a four-building technical center at King of Prussia Park, near here. Construction of the first building will start soon and will be completed by the end of the year. New center will permit an orderly expansion of Pennsalt's growing needs for technical facilities for research, development and technical services.

Falls City, Texas—Susquehanna Western, Inc., a subsidiary of Susquehanna Corp. of Chicago, Ill., plans to construct a uranium mill near here to cost an estimated $2.5 milllion. The installation will be able to process between 200 and 250 tons of ore per day on a 24-hour-a-day basis. Work on the new facility will begin at once for scheduled completion late in 1961. This will be the first uranium mill to be constructed in Texas.

La Porte, Texas—E. I. du Pont de Nemours Co., Organic Chemicals Department, plans to construct a multi-million dollar facility at its Houston Works located here for the production of sulfuric acid. Plant when completed by early 1961 will supply acid for the company's caprolactam plant now under construction at Beaumont, Texas, and will provide an additional source of supply for the petroleum and chemical industries in the Gulf Coast area.

Orange, Texas—Allied Chemical Corp., 40 Rector St., New York, N. Y., plans to construct a plant for the production of high-density polyethylene used in the production of plastic pipe and for films, bottles and other molding compounds. Plant will cost well in excess of $1 million.



"Higgins is a real expert on pulleys!"

Rotan, Texas—National Gypsum Company, Baker Building, 325 Delaware Ave., Buffalo, N. Y., will begin a major expansion of its Rotan Plant at once. The expanded plant will be capable of producing enough gypsum board, lath, plaster and other gypsum building products for approximately 75,000 homes annually. Program will be completed by the second quarter of 1961.

Middleway, W. Va.—Minnesota Mining & Manufacturing Co., 100 Fauquier Ave., St. Paul, Minn., has purchased a former woolen mill here as a site for a new printing products plant. Plant will be modified and expanded so that operations can start during the first half of 1961. Company plans to construct a 25,000-sq ft addition to the 12-year old plant.

Kenosha, Wis.—American Motors Corporation, 14250 Plymouth Road, Detroit, Mich., plans to construct a third automobile assembly line at company's Kenosha unit located here. Work on the additional installation will begin in the spring of this year at a cost estimated at $7 million. The new assembly line will be part of a $39-million expansion program of the company in 1960.

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Tougher... Lighter... Smaller

handles more air...with minimum pressure drop

–and gives you all these other advantages–

Has fewer parts. Locking ring provides positive lock . . . tight fit . . . minimum wear. Equipped with automatic sleeve lock.

Handles any job in your shop using ¾" to ¼" connections— from the air line to the air tool.

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Here's an always ready reference when you want information on couplings in a hurry. Lists complete range of sizes of Hansen One-Way Shut-Off, Two-Way Shut-Off, and Straight-Through Couplings —including Special Service Couplings for LP-Gas, Steam, Oxygen, Acetylene, etc.

Representatives in Principal Cities—See Yellow Pages

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For more facts circle 651 on Reply Card

$11,000

in fuel savings a year

when Space Heaters replaced steam

This was the problem . . . a plant expansion program had added many square feet to existing structures, plus two new buildings. The present steam heating system was inadequate, so management took a long, hard look at heating costs. Rejuvenating the present boiler or installing a new one large enough to provide both heat and process steam involved a major expenditure. In addition, fuel and maintenance costs were high.

This was the solution . . . sixteen Dravo Warm Air Space Heaters of various sizes were installed. Now all working areas in the plant are held at a comfortable 70°, including offices and receiving room. Cold air is drawn into the heaters at floor level, and discharged *above* workers' heads. Warm air is retained in the work area instead of rising to the roof.

These were the results . . . Fuel savings alone amounted to $11,000 per year, a reduction of 48%. In addition, the costs of full-time boiler room employees, and of boiler and steam line maintenance are saved. Since each heater is controlled by an individual thermostat, working conditions are kept at optimum. In the summer, fresh air is circulated by the heater fans.

Interested . . . in what Dravo Counterflo Heaters can do for you? Mail the coupon for full information on the Case Study outlined above, and on money-saving Dravo Heaters.

DRAVO

CORPORATION

Department P-12, Room M-214
Pittsburgh 25, Pa.

Send me free copy of 12-page report on warm air space heating and the facts on the company mentioned above.

Name_____

Company_____

Address_____

City_____ Zone____ State____

For more facts circle 652 on Reply Card

NEW BOOKS

for the plant engineer

On Engineering Geology

NEW INSTRUMENTS AND ENGINEERING GEOLOGY by N. V. Glazov and A. N. Glazov. Size 9¼ by 6⅛ in.; 91 pp; illustrated; cloth bound. Published by Consultants Bureau, Inc., 227 West 17th St., New York 11, N. Y. Price $3.25.

MATERIAL in this book was translated from the Russian text by J. Paul Fitzimmons, Ph.D. Original Russian text was published in 1957. The authors principally present discussions of methods and apparatuses for checking soil characteristics.

Among the subjects dealt with in this book are the following: determination of soil densities by using radioactive elements; an instrument for determining shearing resistance in drill holes; use of radioactive isotopes in obtaining data from bore holes drilled with drilling muds; and the use of horizontal drill holes for water intake. The latter was an approach employed in London by Ranney, an American engineer a number of years ago, according to comment in the book.

The book also includes information on the basic technical requirements for designing instruments for field checking of moisture and density by using radioactive elements, and some rules for working with radioactive material. A table of radioactive isotopes appears at the back of the book.

Oil Hydraulic Power

OIL HYDRAULIC POWER AND ITS INDUSTRIAL APPLICATIONS by Walter Ernst. Size 9¼ by 6⅜ in.; 468 pp including index; illustrated; cloth bound. Published by McGraw-Hill Book Company, Inc., 330 West 42nd St., New York 36, N.Y. Price $12.50.

GENERATION, use, transmission, control, and application of oil hydraulic power is discussed in this book. In this second edition, new material has been added. The book includes some equations and a knowledge of college level mathematics should be of some help in appreciating the book more fully.

The informative work contains six chapters of what may be termed as background material. These deal with: fundamental units of measurement; properties of hydraulic fluids; hydrostatics; hydrodynamics; viscous flow; and viscous and turbulent flow.

In the chapter on the generation of oil hydraulic power, the author comments on various types of pumps and pertinent items. Rotary hydraulic motors, integral hydraulic transmissions and reciprocating motors are subjects of discussion in a subsequent chapter.

Some of the other subjects treated are as follows: JIC specifications for transmission lines; flanged and welded connections; combination controls and panels; hydraulic circuits; servomechanisms and servo valves; the oil hydraulic press; die-casting and plastic machines; tracer-controlled machines; automatic hydraulic systems; reversing pump circuits; and transfer machines.

On Electrical Estimating

ESTIMATOR'S ELECTRICAL MAN-HOUR MANUAL by John S. Page and Jim G. Nation. Size 9¼ by 7¼ in.; 219 pp; cloth covers with spiral backbone. Published by Gulf Publishing Company, P. O. Box 2608, Houston 1, Texas. Price $10.00.

STUDIES WERE made of projects in various parts of the country and these were used to compile estimate figures pertaining to many phases of electrical work. Material costs are not included in this book; neither are setups discussed. Projects studied had a cost range from five to seven figures.

This book contains a vast amount of data in table form on many items. Among these are the following: conduit, boxes and fittings; service and feeder wiring; lighting fixtures; underfloor and bus ducts; starters and motors; and communications system.

One of the fifteen principal sections contains general technical information including electrical formulas, definitions, mensuration units, properties of conductors and electrical symbols.

Vibration Theory

THEORY OF MECHANICAL VIBRATIONS by Kin N. Tong. Size 9¼ by 6⅛ in.; 348 pp including index; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N.Y. Price $9.75.

PRINCIPALLY A TEXTBOOK for teaching advanced students, this fully technical book calls for a working knowledge of higher mathematics through differential equations and also engineering mechanics.

In this book the author discusses the theory and principles of each of three types of systems, i.e. those having a single degree of freedom, two degrees of freedom, and several degrees. He also treats of methods and applications of each type of system. The book contains in addition information on the vibration of elastic bodies. An outline of matrix algebra

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Partlow makes a complete line of electric, mechanical and pneumatic controls (recording, indicating and non-indicating) for temperatures up to 1100°F. Whatever your application problem, Partlow makes an instrument to handle it efficiently, economically, *precisely*. Write for details: The Partlow Corp., New Hartford, N. Y., Dept. PE-310.

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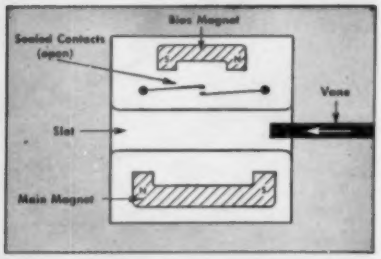
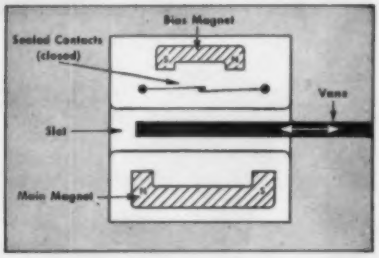
NEW vane-operated limit switch helps industry solve major electrical problem: limit switch life



On normally open form, bias and main magnet flux are balanced at the switch, causing it to remain open. As vane enters the slot, flux of the main magnet is shunted to the lower reluctance path offered by the magnetic material in the vane.



As vane passes the center of the switch, enough flux shunts from the main magnet to cause the flux of the bias magnet to close the switch. Withdrawing vane from the slot reverses the conditions and causes the switch to reopen.

GENERAL ELECTRIC'S ENCAPSULATED DESIGN SEALS OUT CONTAMINANTS; HAS NO ARMS, LEVERS, OR SHAFTS

General Electric's new vane-operated limit switch design surmounts most of the operating problems that cause failure in today's conventional limit switches. The unique new limit switch performs the position-detection function of conventional switches and *eliminates physical contact with the moving object.* It has no shafts or arms to fail, no sliding or rotating parts to wear, no shaft seals to leak.

This means that the operating life of the vane-operated limit switch is not affected by such tough application requirements as frequent operation; hammering of lever arms and mechanisms; lever arm "snapback"; mechanical wear; and splashing and spraying of coolants, lubricants, and other contaminants.

REASONS FOR LONGER LIFE

Contributing to the extremely long life of the new device is the encapsulation of all internal components in a cast aluminum enclosure. This means liquids, dirt, or metal chips cannot enter the switch mechanism and cause operational failure.

In addition, the only moving parts in the new design are magnetic reed contacts hermetically sealed in an inert gas. Thus, switch life is determined almost solely by contact load. When used with small a-c relays, such as the G-E CR2790 general purpose type, the expected operating life of the switch is from 30 to 50 million operations. It is capable of over 250 million operations when operating General Electric static control circuits.

The inherently longer life of the new vane-operated limit switch results in savings from greatly reduced maintenance and replacement expense and less downtime. And the new switch costs about two-thirds less than proximity switches, making it only slightly higher in price than a conventional limit switch.

HOW IT WORKS

The vane-operated limit switch is energized by passage of a separate steel vane through a recessed slot in the switch (see illustrations at right). The vane is attached to the mechanism to be controlled. As the vane passes through the slot, it changes the balance of the magnetic field, causing the contacts to operate. The contacts are hermetically sealed in an inert gas to prolong life.

The new switch is easy to install. Front- or top-operated forms are available to control linear or rotary travel. In addition, the base plate can be rotated 90° to provide mounting flexibility. Both normally open and normally closed forms are available with or without an indicating light. The new limit switch is 25 percent smaller than previous models, and it requires no separate power supply or amplifier.

The switch can detect very high speeds of vane travel without detrimental effects such as arm or mechanism wear or breakage. The switch also offers excellent accuracy and response time. Providing the path of the vane through the slot is constant, trip point repeatability is constant within plus or minus 0.0025 inch. The switch response time is approximately one millisecond.

MEASURABLE ADVANTAGES

Vane-operated limit switches hold significant and measurable operating advantages over conventional limit switches. These advantages can be measured by the maintenance and replacement savings they can produce, and deserve serious consideration on limit switch applications.

For more information contact your G-E sales office or request bulletin GEA-6995 from General Electric Company, Schenectady, N. Y. 811-8

You get
MEASURABLE ADVANTAGES
with General Electric control.

GENERAL ELECTRIC

For more facts circle 654 on Reply Card

NEW BOOKS

in linear transformation of vectors appears in the appendix.

Some of the subjects with which the book deals are: forced vibration under a harmonic force; theory of galvanometer and moving-coil instruments; forced vibration; some principles in vibration control; free and forced vibrations of a damped system; formulation of a problem by differential equation; and forced vibration of elastic bodies.

On Tool Engineering

TOOL ENGINEERING by S. E. Rusinoff. Size 8½ by 5¾ in.; 326 pp including index; illustrated; cloth bound. Published by American Technical Society, 848 East Fifty-Eighth St., Chicago 37, Ill. Price $6.75.

AUTHORED by an experienced engineer and educator, this book delves into many details of tool engineering. It brings into focus areas of equipment selection, tool design, economy of production and other facets that are part of the big picture depicting this important field.

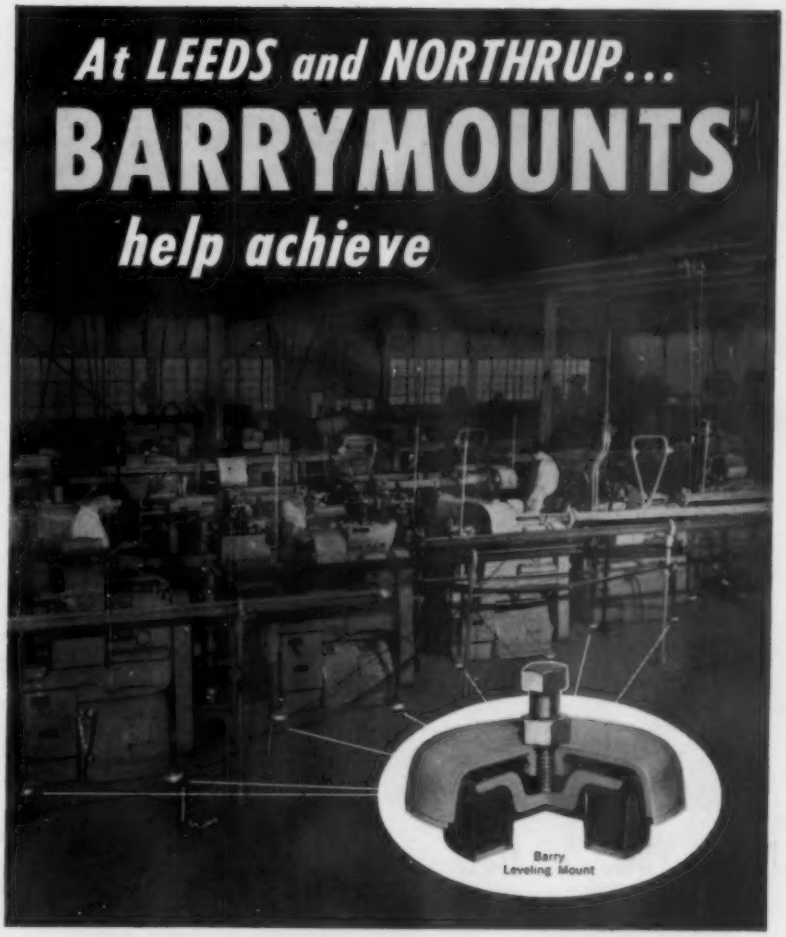
Among the subjects treated in this informative book are the following types of manufacturing costs; elements of a process; tool layout; development of individual operations; jigs and fixtures; locating principles; tolerances, limits, and allowances; material cost estimating; and developing replacement programs.

Dielectrics

DIGEST OF LITERATURE ON DIELECTRICS. Size 10⅞ by 8¼ in. approx; 293 pp; 1959 publication; paper bound. Distributed through the Printing and Publishing Office, National Academy of Sciences—National Research Council, 2101 Constitution Ave., Washington, D. C. Price $5.00.

THERE ARE many comments in this book on the work of numerous individuals on a variety of aspects of the study of dielectrics. Extensive bibliographies appear at the end of the chapters; these are cross-referenced with names mentioned in the discussions.

Chapter topics that are dealt with in this publication are as follows: instrumentation and measurements; tables of dielectric constants, dipole moments, and dielectric times; molecular and ionic interactions in dielectrics; conduction phenomena in solid dielectrics; the breakdown of dielectrics; ferroelectric and piezzoelectric materials; ferromagnetic materials; insulation; and engineering applications.



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Flexibility: Relocation of three mills and a surface grinder in only forty-two minutes.

Reduced Maintenance: Re-leveling of floor-bolted machinery was eliminated. Punch-press down-time was reduced 20%.

Higher Quality: Reduced shock and vibration provided better surface finish, closer tolerances (L&N grinders now hold 0.0001 inch.)

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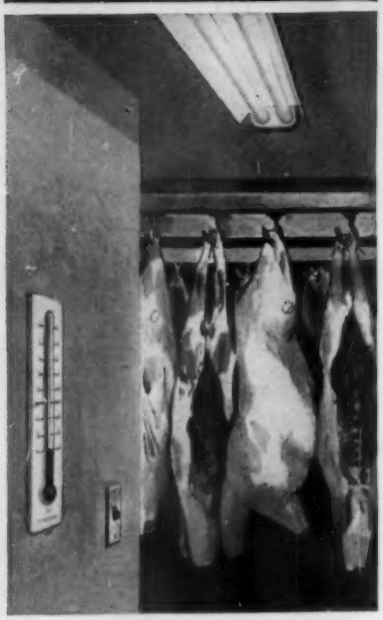
Hints on fluorescent starter selection



YOU CAN USE STANDARD 40W LAMPS IN COLD AREAS WITH G-E FS-44 STARTERS

General Electric FS-44 thermal-switch type starters will start standard 40W preheat lamps reliably at low ambient temperatures — down to 0 F because the preheat time they provide remains constant. Standard glow-switch type starters, under these conditions, require specially-designed low-temperature service lamps for satisfactory operation.

To get more money-saving hints, ask your G-E distributor for the "G-E Starter Selection Chart and Maintenance Guide for Fluorescent Lighting." General Electric Company, Wiring Device Department, Providence 7, Rhode Island.

GENERAL ELECTRIC

For more facts circle 656 on Reply Card

Vibration Isolation Pads

(Continued from page 130)

equipment with speeds of less than 1300 rpm. Equipment in this category requires more than one layer for effective vibration isolation.

To determine the number of layers required, see Fig. 1 which is a plot of disturbing frequencies versus loading curve. From this curve the number of layers of pad for 65 per cent isolation of the disturbing frequency may be determined. On the right hand side of the curve are the vertical disturbing frequencies, and on the left the horizontal disturbing frequencies. If more than three layers are used, a thin steel plate should be inserted between each layer.

Correct size of pad for this type of installation is figured as in the following example:

A large industrial rotary air blower with blower and motor mounted on a common angle-iron frame with four mounting feet, total weight 1800 lb. Motor speed 1050 rpm; blower speed 850 rpm. The blower is the disturbing frequency.

Referring to Fig. 1, in the vertical disturbing frequency column on the right hand side, it is found that with a loading of 50 psi, three layers of vibration-isolation pad are required; thus, 1800 lb divided by 4 equals 450 lb on each mounting foot, at 50 psi, equals 9 sq in. or three layers of pad cut 3 in. by 3 in.

For an example of the application of a vibration isolation pad on equipment with a horizontal movement, assume a horizontal single stroke, single action air compressor with a disturbing frequency of 300 strokes per minute. On the left side of Fig. 1 find 300 cpm. By following the curve to 50 psi loading, it is seen that five layers of pad are required. However, a piece of equipment of this type generally does not have sufficient weight for the amount of horizontal force that it creates, therefore, an inertia block is required to add mass. **End**

Want Tear Sheets?

If you would like tear sheets of any articles appearing in this issue, just drop a line to The Editor, Plant Engineering, 308 East James St., Barrington, Ill.

a good team for steam

This Yarway team has scored high—over a million installed on all types of steam equipment. Stocked and sold by 270 Industrial Distributors. For free Steam Trap Book, write YARNALL-WARING CO., 145 Mermaid Ave., Philadelphia 18, Pa.

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A REPORT TO MANAGEMENT ON HOW

Industry cuts costs with FIR PLYWOOD

ROUTE TO:

- ☐ ENGINEERING
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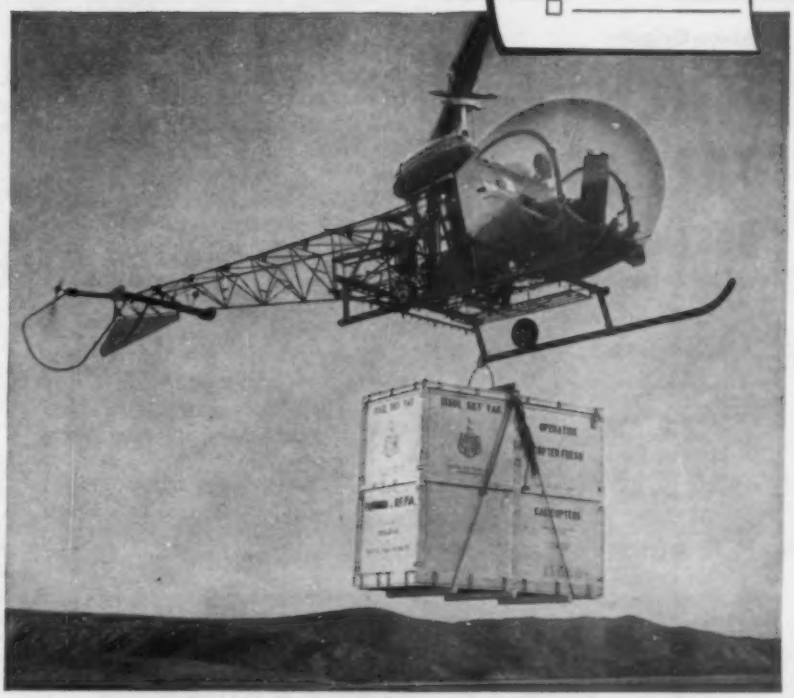

Plywood Sky Vans are the key to a revolutionary new service offered by Calicopters, a California helicopter line offering fast, field-to-market air shipments of prime, highly perishable fruits and vegetables.

Developed by Shield Fabricators, Inc., of Gardena, specialists in design and construction of freight and cargo vans, the new Insul Sky Vans are made of lightweight fir plywood, lined with two inches of foam insulation. Properly sealed, the containers stabilize temperature of pre-cooled contents within 3 degrees for 48 hours.

The standard Sky Van is 84x42x72 inches and carries over a ton of produce in its 113-cubic-foot interior. Assembled with metal Klimp fasteners, the boxes can be knocked down and returned flat at minimum cost for re-use.

Plywood construction holds down weight and fabricating costs, and also provides tremendous resistance to racking stresses and impact.

Stronger than steel, lighter and lower in cost, these giant fir plywood box girders were used on the new International Paper Co. converting plant in Auburndale, Fla. Four feet deep and 48 feet long, the girders have one-inch plywood webs with 2x12 lumber flanges and stiffeners. Available in most parts of the country through component fabricators (write for names), plywood beams can be engineered for any load or span and fabricated in almost any shape. Other advantages include ease of handling and smooth, paintable surfaces.

Computer floor system installed at a leading West Coast university employs vinyl-covered 1⅛" thick plywood over steel supports to provide the strength and stiffness needed to withstand tremendous loads of giant data processing machines. Raised plywood floors for computers permit free cable runs and space for air conditioning. Sections can be removed for servicing or circuit changes.

FOR MORE INFORMATION about fir plywood—its uses, properties and advantages—write

DOUGLAS FIR PLYWOOD ASSOCIATION

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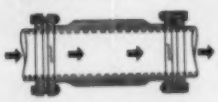
PINCH VALVES

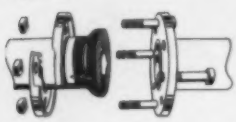
RUBBER, NEOPRENE for Corrosion and Abrasion

- 1" to 14" inside diameter.
- Pressures to 150 psi.
- Temperatures to 200° F.
- Patented "hinged" sleeve. Recesses serve as "hinges" during compression; reduce strain and permit tight closing.

- Cannot leak or stick.
- No working parts in contact with pulp or liquid; no packing glands.



- Unobstructed flow eliminates high friction loss.
- Remote control available.
- Can be equipped for automatic regulation.



- Split flanges and patented Flex Seal ends assure perfect seal.
- Closing mechanisms... manual handwheel; handwheel with chain and sprocket reduction unit; electric worm gear motor reducer; chain operated torque arm reducer; hydraulic; air-hydraulic.

WRITE FOR NEW CATALOG...

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Air Compressor Unloading

(Continued from page 132)

step control. We therefore have zero per cent on one position, 50 per cent on S-1, 50 per cent on S-2, and 100 per cent with S-1 and S-2 operating.

Stopping the compressor whether by pressing a trip button, because of overload, under voltage, motors falling out of step, or field failure opens the circuit breaker and the time contact. This unloads the compressor by de-energizing S-1 and S-2 for coasting to stop.

What have we gained with all this circuitry?

1. We have eliminated the time wasting steps of manual loading and unloading.
2. We have 0-50-100 per cent capacity control by simply operating a selector switch.
3. The 50 per cent flip-flop controls contributes to even valve duty, longer valve life.
4. The air passes in and out of the cylinder inlet valves without compression during partial load periods or 50 per cent control, with cooling effect.
5. A considerable power recovery is made, because unloading losses are reduced when machine operates at 50 per cent capacity.
6. Ease of adjustment and trouble shooting. **End**

CONSTRUCTION BRIEFS

This series of articles, which has appeared bi-monthly for the past five years, is available in a set of booklet reprints. The first four cost 50 cents apiece, the last one 75 cents . . . for a total of $2.75 for the set.

The first booklet discusses beams, reaction, bending moment, shear, moment of inertia, and section modulus; the second, deflection, horizontal shear, floor loading, framing, columns; the third, columns, trusses, connections, welded connections; the fourth, fastenings for timber and a four-part series on the structural design of an industrial building; the fifth, a seven-part series on designing in reinforced concrete.

For any one, or all, of these "refresher" booklets, address the Editor, Plant Engineering, 308 E. James St., Barrington, Illinois.

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—more safety

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LADDERS

Just as today's cars feature a low "c.g." for on-the-road safety, so Ballymore ladders feature a low "c.g." for all-level safety. The safe, wide-base pyramid design with a low center of gravity gives a new stability even at heights up to 15 feet.

Sturdily welded, corrosion-resistant steel and aluminum Ballymore ladders are mobile and can be moved easily on casters to any area. Simple tip-toe pressure anchors the rubber tipped feet to the floor and securely positions the ladder.

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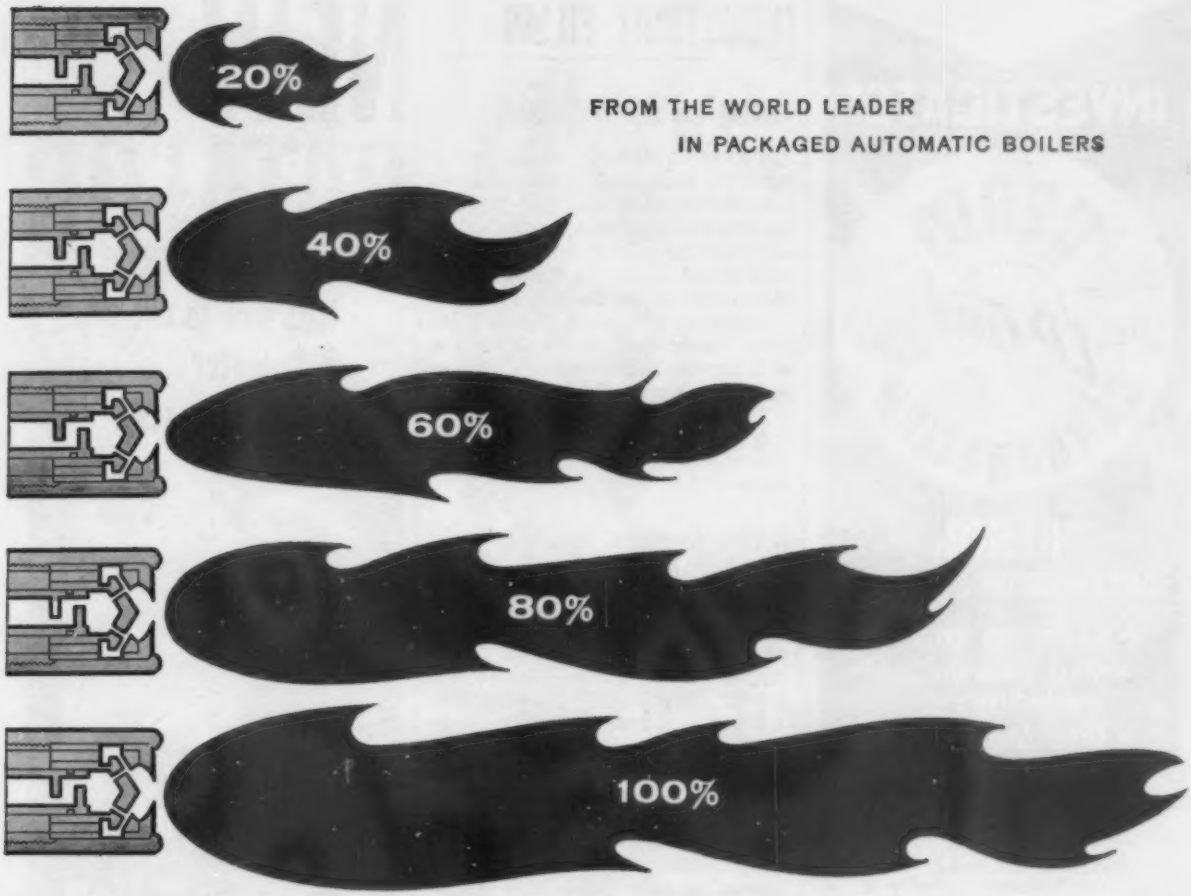

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Gives you equal efficiency from 20% to 100% of full firing rate or *any* load in between

For every firing load there is *one* right fuel/air mixture for proper combustion. Only *Powermaster* gives you this maximum efficiency because its exclusive modulating firing control delivers perfect fuel/air mixture *automatically* . . . at *any* firing rate.

This exclusive O&S feature is important to you for two reasons: 1. Operating efficiency is as high at 20% as at 100% and gives you impressive fuel savings at *all* firing rates; 2. Pressure or temperature is kept constant at *all* loads, resulting in more uniform process and in improved product quality. This feature is available in O&S oil, gas and combination burners for process, heating and hot water applications.

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- Easiest to Install
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For instance, the Beam Model 60 Vaporizer-Regulator is only 4" in diameter, 3" thick and weighs 24 oz. It handles all engines up to 60 hp.

The Beam "Water-Runner" installation system saves time, cost and space.

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INDUSTRIAL FILMS

Heating and Air Conditioning

THE COMPLETE STORY of the manufacturing process of heating and air conditioning equipment, from unloading of coiled steel to a finished product ready for customer delivery, has been filmed at the La Puente, Calif. plant of the Payne Co.

Locations utilized in the film include Marineland, Sunset Boulevard in Hollywood, Los Angeles Coliseum and the company plant.

The film is in color, with sound, and runs for 18 minutes. A series of showings is now being made to the industry.

In-Floor Conveyors

HOW IN-THE-FLOOR type conveying systems for moving four-wheel platform trucks, solve material handling problems, are the subject of "Pathway to Profits" a 12-minute, 16 mm sound, color Link-Belt Company film.

The film illustrates how Trukveyor installations can solve the many problems of handling merchandise shipments and reduce operating costs on railroad terminals, motor freight docks, air and water terminals, distribution centers, parts depots, warehouses, assembly plants, and in general many manufacturing plants. This method of conveying of large component parts through process and assembly operations in a plant of a

heavy equipment manufacturer is also shown.

A recent application of the system in a drug warehouse is illustrated. It makes short work of both pharmaceutical order filling and stock replacement.

"Pathway to Profits" is available without cost on letterhead request for showing in the U.S. Write Public Relations Department, Link-Belt Company, Prudential Plaza, Chicago 1, Illinois.

NEW CATALOG

tells how to cut D. C. motor operating costs

. . . with Ideal Preventive Maintenance products—a complete line of Resurfacers, Flexible Abrasives, Precision Grinders, Brush Seaters, Commutator Cleaners, Mica Undercutters and other tools—designed to eliminate high repair costs and keep your motors at top efficiency with low-cost prevention methods. Used and endorsed by many of the nation's largest companies.

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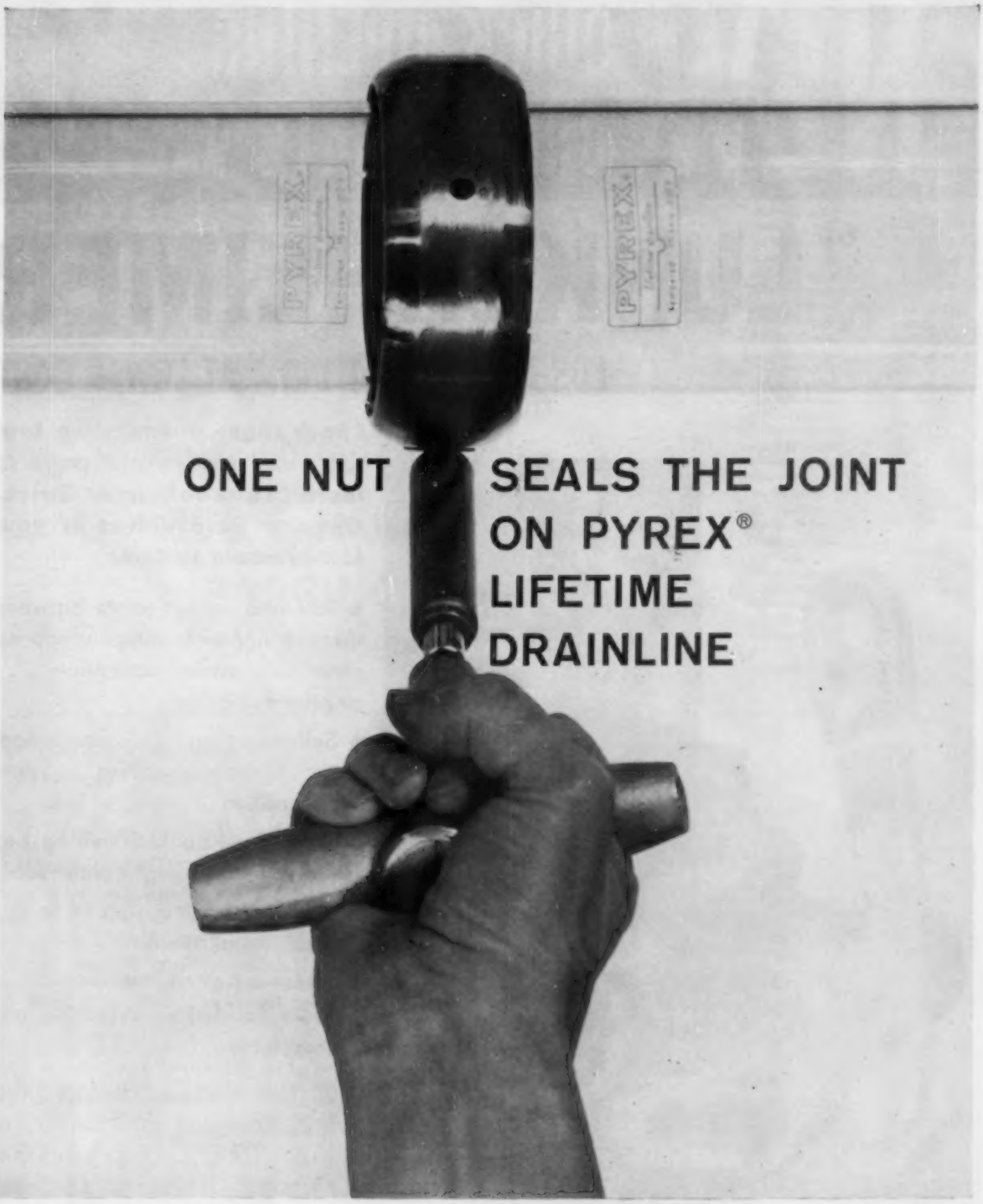

ONE NUT SEALS THE JOINT ON PYREX® LIFETIME DRAINLINE

This simple joint is one of the reasons we can guarantee PYREX laboratory drainline against corrosion and leakage for the life of the building in which it is installed.

Stab this simple coupling with two lengths of PYREX lifetime drainline. Turn the single nut until the torque wrench spins free. You've got a positive, lifetime seal.

Plus: Ten-foot lengths mean fewer joints. Light weight means fewer hangers. One-nut joint means fewer work hours.

SEND FOR NEW BULLETIN which spells out guarantee, explains why PYREX lifetime drainline is the least expensive you can install. Write for PE-30 to Plant Equipment Department, 10 Crystal Street, Corning, N. Y.

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NEW QUICK-OPENING BRONZE GATE VALVES

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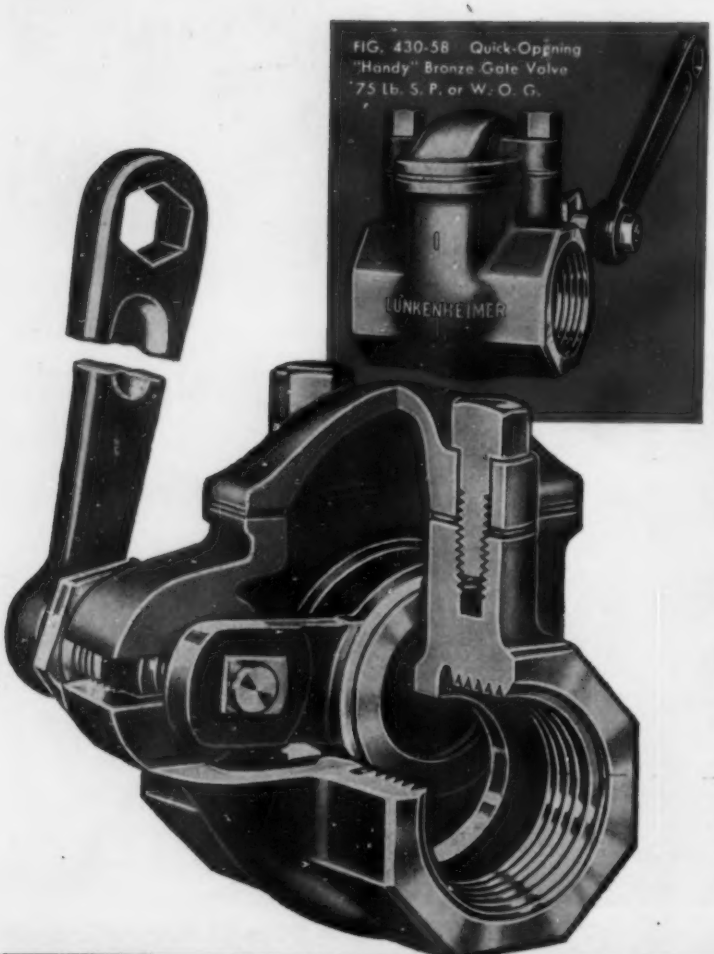

Check these outstanding features and see why it pays to install Lunkenheimer Quick-Opening Gate Valves in <u>your</u> low-pressure system:

- Ball and socket joints between discs for tighter seating under pressure . . . easier operation . . . greater flexibility
- Self-adjusting discs for longer wear . . . tighter seating . . . lower maintenance
- Deep, well-packed stuffing box for a longer-lasting, tighter seal
- New, compact design to fit into "close" installations
- Easy-operating cap screws for faster assembly and disassembly

For full details, contact your Lunkenheimer distributor, or write The Lunkenheimer Company, Cincinnati 14, Ohio.

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BULLETINS

(Begins on page 23)

143 Hydro-Valves—Complete details on company's nonchattering hydro-valves for liquid service are presented in Bulletin L-100/59. Specifications, data on sizes, capacities and materials. J. E. Lonergan Co.

144 Glass-line Steel Pipe—Features and advantages of company's glass-lined pipe—glass inside, steel outside—designed for a wide range of highly corrosive services are detailed in 8-pp Bulletin 989. Four simple steps to install pipe are illustrated. The Pfaudler Co., Div., Pfaudler Permutit Inc.

TUBING

145 Stainless Steel Tubing—Information on mechanical properties, corrosion resistance, theoretical bursting pressures and other design data on stainless steel welded and seamless tubing is presented in the 34-pp booklet. Fabrication and design data, and detailed specifications are included, along with photos and drawings. Allegheny Ludlum Steel Corp.

146 Matching Tubes to Jobs—To aid in selection of correct grade of alloy steel for tubing applications, 6-pp Folder TDC-193 discusses two general purpose steels which lend themselves to standardization. These are 4340, a through hardening steel, and 4620, a case-hardening steel, both available in the tube form in a range of sizes. General characteristics and technical data. Tubular Products Div., The Babcock & Wilcox Co.

TOOLS, WELDING AND MACHINE SHOP EQUIPMENT

147 Woodworking Tools—Bulletin M159-A illustrates and describes company's line of tools for mortising, boring and routing, including those which can be used in portable power boring equipment. Descriptive details on the various types of tools, including carbide, high-speed steel, spur, ship-auger, solid-center, extension-lip, relishing and others included. Greenlee Tool Co.

148 Power Tools—Described and illustrated in 44-pp Catalog 60 are band saws, contour saws, jig saws, saw tables, saw-jointers, jointers, belt sanders, spindle sanders, shapers, shaper cutters, lathes, planers, drill presses, band filers, grinders and spinning tools. Among new tools shown are a 10-in. tilt arbor saw, a heavy duty gear drill press, and improved hand stroke belt sander. Boice-Crane Co.

149 For Aluminum Welding—Where and how to use aluminum for welding, brazing and soldering is the subject of a series of charts listing psi tensile strength, recommended joining material, percent elongation and typical uses for 24 aluminum alloys. Tables show various breakdowns for 15 types, as well as data on melt and flow temperatures of typical aluminums, plastic ranges, recommended filler materials, solder selection. All-State Welding Alloys Co., Inc.

150 Welding Accessories—Sixteen-pp Catalog EW-211 contains illustrated information on welding supplies and accessories, including headshield, grinding shields, goggles, cleaning tools, electrode holders, cable connectors, ground clamps, work holding clamps, welding cable, protective clothing, welding gloves, other equipment. Hobart Brothers Co.

151 Hand Torches—Illustrated and described in 36-pp Form ADC-702E are gas welding and cutting hand torches, outfits, tips and accessories. General descriptions of various types of welding and cutting torches are included, with data on features and detailed specifications, as well as specification charts on welding and cutting tips for general purpose and special gas welding and cutting. Air Reduction Sales Co., Div. Air Reduction Co., Inc.

152 Flame Cutter—Eight-pp Form ADC 899 introduces the Linagraph, a flame cutting machine of pantograph design suitable for straight line and shape cutting on 8-ft. steel plate. Discusses construction and operation of the Linagraph, explains and illustrates its principal features, such as centralized operator control, and adapatability to various tracing devices. Air Reduction Sales Co., Div., Air Reduction Co., Inc.

Suggestions on Leasing Machines and Equipment

153 Leasing Machines?—Form HU-6002 discusses the Profitivity lease plan, a new approach to leasing arrangements for machine tools. Explains how security deposits and down payments are not involved, finance charges at low bank rates, other advantages. Jones & Lamson Machine Co.

154 Equipment Leasing—This brochure explains company's program of leasing diversified, non-expendable equipment and fixtures to all types of business and industries. Illustrates and explains advantages and economies of leasing. United States Leasing Corp.

CONSTRUCTION

155 Concrete For Construction—Use of lightweight aggregate concrete in modern construction is illustrated and described in 20-pp Bulletin MBR-P-14. Thirteen construction projects are illustrated with discussion covering use of concrete as structural material for columns, beams and floor slabs, multi-story structures, thin shell concrete and bridge decks. The Master Builders Co.

156 Roofing and Siding—Advantages of an asbestos protected steel core roofing and siding for industrial applications are detailed in this 8-pp product bulletin. Includes reports of various tests performed on material, such as abrasion, corrosion, bending, impact and flame test, as well as design and performance data, specifications. Bowman Steel Corp.

Postage-free Reader Service Cards make it easy to order bulletins. Cards are provided on the facing page.

157 Translucent Panels—This 8-pp bulletin introduces Sanpan translucent building panels, described as a structural sandwich panel for wall systems and units and curtain wall insert panels. Provides specifications and roughing-in details. Design advantages possible with wide choice of colors, excellent insulating values, stressed. Panel Structures Inc.

158 Skylight Products—Illustrated and described in this product bulletin are skylights fabricated of fiber glass reinforced translucent panels and extruded aluminum frames. Design data and specifications are included, installations pictured. The Marco Co.

159 Non-Shrink Grouting—Sixteen-pp Bulletin E-1d explains how to overcome grout failure due to shrinkage, through use of properly applied non-shrink grout. Outlines and illustrates common methods of grouting different types of equipment, the mixing and placing of grout and cold and hot weather grouting. The Master Builders Co.

BELTING, HOSE, FITTINGS

161 Belting and Hose—Illustrated and described in 34-pp Catalog 285 is a variety of belting and hose products for industry. Lists rubber belting, rubber cover conveyor belts, rough-top rubber belting, food conveyor belting, leather belting, V-belts, belt lacing, air and water hose, rubber-lined hose, welding hose, steam hose, and other products. Benj. B. Nusbaum & Co., Inc.

162 Hose and Fittings—Comprehensive data on hose and hose assemblies, brass and steel tube fittings, hose and tube working tools, stock cabinets, hose racks and other specialty products are presented in 218-pp Catalog C-300. Profusely illustrated, it contains hose selector chart, assembly data chart, detailed specifications, technical data, application and installation instructions. Available to qualified plant engineers. The Weatherhead Co.

ELECTRICAL

163 For Electrical Distribution—Comprehensive information on electrical distribution products is presented in this 60-pp catalog. Divided into three main sections covering molded case circuit breakers, individually-enclosed low-voltage power

BULLETINS

(Begins on page 23)

circuit breakers, and engineered products, it contains selection and application data, selection charts listing types, ratings and accessories. I-T-E Circuit Breaker Co.

164 Distribution, Control—Complete with photos, specifications, pricing information, and wiring diagrams, this 155-pp reference catalog covers circuit breaker load centers, fusible service equipment, enclosed safety switches, low voltage fuses, molded case circuit breakers, enclosed industrial circuit breakers, wall mounted air circuit breakers, bolted pressure contact switches, lighting and distribution panelboards, distribution switchboards, package power centers, wireways, bus duct, manual starters. Book is available to qualified plant engineers. Federal Pacific Electric Company.

165 For Voltage Regulation—Sixteen-pp Bulletin 21B7977E describes some 23 features of company's JFR distribution regulators which promote more economical and better voltage distribution. Among these are savings in height and weight for greater mounting versatility, new sight indicator for fast oil level check, unit constructions. Fully illustrated, booklet includes specifications, available ratings. Allis-Chalmers Mfg. Co.

166 Motor Control Centers—Features and advantages of company's line of motor control centers available in either modular units or panel mounted model are detailed in 16-pp Descriptive Bulletin SPM-1-1159. Illustrates construction details, typical layouts and methods of figuring combinations, and includes suggested specifications. Automatic Control Co.

167 Control Panels—Selection of the right control panel for a wide variety of automatic materials handling systems is the subject of 12-pp Bulletin G-9. Four basic types, the "walk-in" master control panel, the floor and wall-mounted types, and the explosion-proof type are illustrated and described. Fuller Co.

168 Circuit Breakers—Six-pp Bulletin GEA-7070 describes a line of circuit breakers featuring symmetrical terminal construction with in-line mounting holes on the line and load ends. Provides selection, application, ordering information. Well illustrated. General Electric Co.

169 Toggle Switches, Assemblies—Catalog 73d, 32-pp, presents high-performance toggle switches and toggle switch assemblies for use in electronic and other applications. Selection includes pull-to-unlock, hermetically sealed, "electric memory", rocker-actuated and miniaturized designs. Pages are packed with detailed descriptions, photos, diagrams, dimensional drawings and specification tables. Micro Switch Div., Minneapolis-Honeywell Regulator Co.

170 Charge Control—Installation and use of company's charge control unit, which simplifies daily and equalizing charging of batteries for electric industrial trucks and others, are described in Bulletin Form 5092. Featured are instructions and diagrams showing charging methods. Exide Industrial Div., The Electric Storage Battery Co.

171 Wire and Cable Data—These composite, color-coded data sheets contain information that formerly could be found only by thumbing through many catalogs on wires, cables and power cords. Lists prices, stranding, strand diameters, temperature ratings, weights. Hatfield Wire & Cable Div., Continental Copper & Steel Industries, Inc.

172 Rubber-Jacketed Cord—Illustrated and described in this product bulletin is a line of rubber jacketed portable electrical cord. Construction details and advantages are detailed. Western Insulated Wire Co.

173 Channel, Fittings, Hangers—This pocket-size reference type work manual, about 68-pp, contains product illustrations and correlated information on structural support materials for electrical installations. It is indexed to sections identified with specific areas of applications . . . as for suspending single and multiple runs of conduits; building racks and frames; concrete inserts; beam clamps for fastening to structures; brackets and supports; fluorescent fixture supports. A section is devoted to engineering information on product use and design. Also included are rigid conduit data, standard pipe data. Steel City Electric Co.

HEATING, COOLING

174 Infra-Red Heating—Bulletin Pc 1-59 gives specifications and dimensions on infra-red radiant heaters, including a hooded unit, which use any commercial gas for fuel and need no electrical power source. Describes construction features, control arrangements available. Panelbloc Div., Bettcher Mfg. Corp.

175 Process Heating Solutions—Bulletin 102.2, prepared to help solve process heating problems, explains how liquid heat transfer units for heating jacketed equipment can be used to advantage in the process industries. Provides illustrated examples of application of packaged heating units in pharmaceutical and asphalt production, in batch and continuous operations. Hynes Electric Heating Co.

176 Industrial Heat Exchanger—This Selection Data Form covers a complete line of industrial heat exchangers, including a package regenerative air preheater designed for industrial process or boilers in a range from 25,000 to 250,000 lb per hr; recuperative type heat exchangers for high temperatures, high pressure applications where leakage cannot be tolerated; and a compact rotary regenerator. The Air Preheater Corp.

177 Heat Exchangers—Shell and tube heat exchangers, including copper base alloy, steel and stainless steel fixed tube bundle heat exchangers, are illustrated and described in 16-pp Catalog 1258A. Includes tables of pressure ratings and material specifications for steam service heat exchangers, selection data. The Young Radiator Co.

Ideas on Preserving Drawings and Paper Work

178 Keep it Clean—How to clean and protect engineering drawings is told in this 6-pp folder. Describes cleaning aides and protective spray, giving ordering information and prices. Keuffel & Esser Co.

179 Reproduction Materials—Drawing and document reproduction materials are featured in this 20-pp bulletin. A reproduction materials selection chart lists a variety of reproduction jobs, type of equipment to be used and the reproduction materials needed for this. Eastman Kodak Co.

180 Facts About Microfilm—"Let's Take a Positive Look at Microfilm," is the title of this article reprint discussing the merits of using microfilm as an active tool of business and industry. Typical applications are illustrated. Minnesota Mining and Mfg. Co.

OTHER EQUIPMENT

181 Aluminum Roof Coatings—Application details and complete specifications on aluminum roof coatings are presented in this 8-pp product bulletin. Advantages of the aluminum coatings, reinforced with fibre glass, are discussed and typical applications shown. The Garland Co.

182 Rolling Door Maintenance—This 16-pp booklet is a maintenance and parts manual for manufacturer's rolling steel doors. It is designed to aid in ordering of replacement parts when doors are damaged. Besides including a section on typical door construction features and one covering inspection periods, door adjustments and continuing maintenance procedures, manual shows door components. The R. C. Mahon Co.

183 Water-tight Sealant—Physical properties and characteristics of company's two-component synthetic rubber compound based on liquid polysulfide polymer for use in sealing joints where an absolutely watertight seal is required are detailed in 16-pp Bulletin 6543. Lists advantages, applications. A. C. Horn Companies.

184 For Grounds Maintenance—Versatility of company's tractors and equipment for roadside and grounds mowing and mulching, street and parking lot cleaning and snow removal, landscaping, and other maintenance jobs is illustrated in this full-color 8-pp bulletin. Tractor and Implement Div., Ford Motor Co.

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If your steam needs range between 4,000 and 150,000 pounds per hour, one of these versatile C-E Boilers will give you economical, standout performance. For while they are standard in design (which means lower first cost and proven performance), they're still *flexible* enough to be easily adapted to meet almost any standard equipment.

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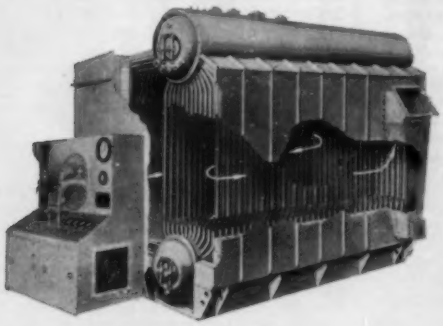

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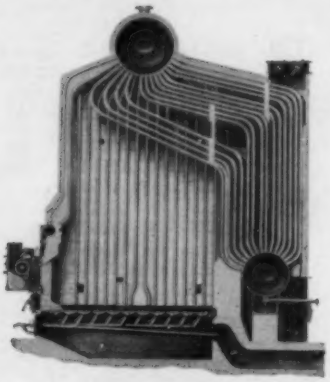
This completely shop-assembled boiler is available in fourteen sizes from 4,000 to 90,000 pounds of steam per hour . . . for operating pressures up to 700 psi . . . temperatures to 750 F . . . for pressure firing of liquid or gaseous fuels. The VP Boiler has more water-cooled area per cubic foot of furnace volume than any other boiler of its size and type. The large lower drum – 30-inch diameter – permits a simple, symmetrical tube arrangement . . . greater water storage capacity . . . easy access for washing down or inspection. A centrifugal fan, which operates at low speed and is exceptionally quiet in operation, is standard equipment. The simple baffle arrangement results in low draft loss . . . simple soot blowing . . . no dead pockets . . . high heat absorption. The VP is enclosed in a reinforced gas-tight, welded steel casing, and shipped completely assembled with firing equipment, fittings and forced draft fan. For foundation, it needs only a simple concrete slab.

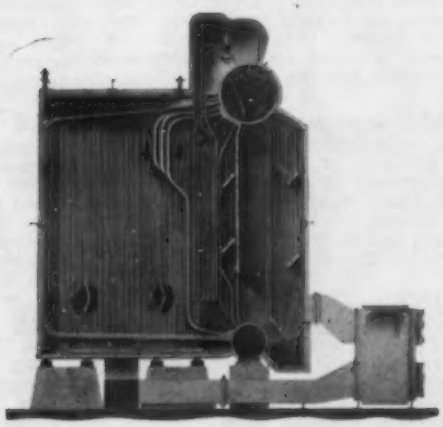


C-E Vertical Unit Boiler, Type VU-10

The VU-10 is available in nine sizes from 10,000 to 60,000 pounds of steam per hour . . . for operating pressures up to 475 psi . . . superheat to 150 F in 20,000-60,000 lb range . . . for solid, liquid or gaseous fuels. This boiler is a completely standardized design adaptable to many conditions. It is bottom-supported and needs no outside supporting steel. It operates efficiently over a wide range of output and is easy to operate and maintain. All parts are easily accessible for inspection. The VU-10 is a complete unit – boiler, furnace, setting, fuel-burning equipment, controls, forced draft, heat-recovery equipment (if desired). Regardless of fuel, the same general cross-sectional arrangement of drums, convection bank and furnace wall cooling is used. Uniform design through each transverse section assures even water level in the drum and uniform expansion.

C-E Vertical Unit Boiler, Type VU-55

The VU-55 Boiler is available in five sizes ranging from 70,000 to 150,000 pounds of steam per hour. It is designed for pressures from 250 to 750 psi for all sizes and for up to 300 degrees F of superheat. Heat-recovery equipment may be added if desired. VU-55 Boilers are designed for the pressure firing of oil or gaseous fuel and require no induced draft fan. They are equipped with tangential burners and tangent furnace tubes to assure a level of performance which compares favorably with modern utility practice. Equipped with a large (60-in) steam drum, the VU-55 has generous water capacity and steam reservoir space. C-E drum internals assure high quality steam at all ratings. The absence of outside downcomer tubes and ducts makes possible the attractive streamlined exterior of the VU-55.



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DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided on pages 271 and 272.

BOILERS AND GENERATORS

301 Automatic Boilers—Powermaster Model 3 packaged automatic boilers are described and illustrated in 12-pp Bulletin 1260. Boiler types, including gas, oil and combination gas-oil models, a specially-designed hot water boiler, and steam atomizing principle for use with No. 6 oil are included. Orr & Sembower, Inc.

302 Hot Water Boilers—Catalog HCC-2, 20-pp, describes and illustrates design, construction, advantages and economics of company's controlled circulation hot water boiler for supplying high pressure, high temperature water for heating systems and process applications. Combustion Engineering, Inc.

303 Boiler Construction—Bulletin BE100 describes advantages of practical boiler construction with 2 pass design, featuring comparable results with equal heating surface, but with Continental's two-pass features—turbulent spinning gas technique-uniform heating, no refractory baffles and symmetry of furnace layout. Boiler Engineering & Supply Co.

304 Hot Water Boilers—Featured in this Product Bulletin AD-183 is a line of hot water boilers with forced thermal circulation and high velocity tempering flow. Internal flow pattern is shown on cutaway, and design and test data given. Cleaver-Brooks Co.

305 Steam Generators—Advantages of company's steam generators designed to adjust to actual production needs are detailed in this 6-pp Product Bulletin C-731. Schematic diagram showing operating details is included. Clayton Mfg. Co.

306 Packaged Steam Generators—Bulletin B-3255 contains detailed information on shop-assembled steam generators in capacities from 10,000 to 60,000 lb of steam per hour. Advantages of construction, performance and maintenance are illustrated. The Titusville Iron Works Co.

307 Packaged Generators—Detailed information on company's line of package steam and hot water generators is presented in illustrated Form 35. Advantages of design are discussed. Cyclotherm Div., National-U. S. Radiator Corp.

308 Generators, Auxiliaries—20-pp Catalog SB 60, on steam generators and allied equipment, provides cross section views of major products to show design and construction. Standard and special boilers are included, also burners. Erie City Iron Works.

LUBRICANTS, LUBRICATION

309 Organized Lubrication—Benefits of organized lubrication—major cost control factor are extolled in this 24-pp bulletin. Cost control opportunities are detailed and the task of assigning responsibilities and delegating authority in an organized lubrication system covered. Texaco, Inc.

310 Lithium Greases—This product information bulletin presents manufacturer's six Litholine industrial greases, stressing industry advantages offered by these multi-purpose greases. Sinclair Refining Co.

311 Lubricant Data—Characteristics, advantages of company's line of specialized fluid and grease type lubricants are described in 32-pp Data Book 59-1. Includes sections on control of friction, use of grease type lubricants, proper applications, and recommendations for various operating conditions. Lubriplate Div., Fiske Brothers Refining Co.

312 Product Guide—This handy little booklet gives information on manufacturer's line of industrial products—general lubricants, greases, diesel lubricating oils, metalworking oils, hydraulic oils, heat-transfer oils, waxes, petro-chemicals, spray oils, solvents, others. Sun Oil Co.

MECHANICAL POWER TRANSMISSION

313 Fluid Drive—Eight-pp Bulletin 9819 describes and illustrates adjustable speed Gyrol fluid drives, 1- through 25-hp, giving advantages and applications. Components and operation are also covered in detail. Industrial Div., American-Standard.

314 Mechanical Drive—Six-pp Bulletin 3600 describes the Allispede mechanical adjustable speed drive which operates on a-c power, offers speed ranges up to 8:1, ratings from 1 to 30 hp. Gives engineering and applications information. Illustrates modifications to the basic drive. The Louis Allis Co.

315 Flange Mounted Drives—Bulletin 7140 contains selection data for flange mounted drives for a variety of applications. A load classification table is included, as well as tables of minimum sheave pitch diameters, load location factors, overhung load capacities. The Falk Corp.

316 On Drive Selections—Steps in selecting a heavy duty V-belt drive are outlined in 16-pp Bulletin DH-301. Service factor table, design horsepower table, minimum installation allowance table and complete selection tables are included. The Gates Rubber Co.

317 Helical Gear Reducers—Information on a complete line of helical gear speed reducers is contained in 20-pp Book 2751. Provides selection data on 20 reducer sizes in double, triple and quadruple reductions, and contains tables of load classes and service factors, horsepower and torque ratings, dimensions, overhung load for high and low speed shafts, and mounting data. Link-Belt Co.

318 Precision Gears—This 32-pp booklet contains pictures, engineering drawings and data for everyday application of precision gears and allied components. A few of the subjects discussed are "tooth-to-tooth error," burrs, pin hubs, clamp-type and hubless gears, stainless steel vs nylon, pitch ranges, backlash, worm and wheel drives, etc. Pic Design Corp.

319 Flexible Couplings—Comprehensive selection data on flexible couplings is presented in 48-pp Engineering Catalog 60. Misalignment is described and basic coupling arrangements and load classifications are included, along with photos of couplings and installations, diagrams etc. Thomas Flexible Coupling Co.

320 Anti-Friction Bearings—Catalog 424-B entitled "The broadest line in the anti-friction field," is an 8-pp folder giving capsule presentation of company's entire product line. A brief description of each product is provided. SKF Industries, Inc.

321 Industrial Bearings—Comprehensive information on company's line of industrial bearings and pillow blocks is presented in 80-pp Bulletin A670. Contains load rating tables and detailed selection data on pillow blocks, flange bearings, hanger bearings, bearing units and take-ups, as well as cutaway views and diagrams showing design. Dodge Mfg. Corp.

ELECTRICAL

322 Drip-Proof Motors—Bulletin 857 contains 12-pp of detailed information on company's line of open drip proof and totally enclosed fan cooled motors. Construction features are described and tables of engineering data and specifications included. Brook Motor Corp.

323 Unit Substations—Tranfo-Units—packaged, compact unit substations—are described in 16-pp Bulletin 5604-1A. Provides basic design, application and specification information of value in selecting integrated combinations of equipment. Consisting of transformer with primary and secondary switchgear, these units permit voltage stepdowns at load area. I-T-E Circuit Breaker Co.

324 Circuit Breakers Panelboards—Bulletin 306 describes plug-in circuit breaker panelboards for automatic protection of a-c or d-c lighting and appliance circuits. Capacity data is

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DATA FILE

(Begins on page 276)

included, as well as typical wiring diagrams, table of catalog numbers, ratings and sizes, and specifications. Frank Adam Electric Co.

325 Molded Case Breakers—Features and advantages of company's molded case circuit breakers are illustrated and described in 28-pp Bulletin GEA-6754. A cutaway view tells the inside story of circuit breaker design, and complete selection data, including section on determining ampere rating, is furnished. General Electric Co.

326 Switch Wiring Diagrams—Bulletin 709 is a 36-pp booklet of typical wiring diagrams for across-the-line starting switches. Indexed and arranged for easy use, this booklet serves as a guide to some of the many ways in which this company's manual and magnetic across-the-line starters are used. Allen-Bradley Co.

327 Enclosed Switches—Catalog 83, 22-pp, Catalog 84, 16-pp, and Catalog 101, 24-pp, describe enclosed switches for industrial uses. Included are general switches designed for use on either a-c or d-c applications, sealed switches, heavy-duty limit switches, hand operated switches, and maintained-contact switches. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

328 Safety Switch Design—Advances in safety switch design are illustrated and described in this 28-pp Product Bulletin CPD-74. Features designed to increase safety, save in space, and provide for easy installation and long life are stressed. General Electric Co.

329 Power Panelboards—Design and operation features of company's power panelboards with Vacu-Break arc control are illustrated and described in 18-pp Bulletin VBP-470. Circuit ratings are tabulated and layout procedure detailed, information on boxes, interiors, trims and doors included. Bulldog Electric Products Div., I-T-E Circuit Breaker Co.

330 Trolley Busway System—Three bulletins offer help on electrical installations involving cranes and hoists, assembly and production lines, test lines and other moving electrical equipment. Bulletin 60, 40-pp, covers 60 amp systems; Bulletin 70, 32-pp, covers 225-500 amp systems; Bulletin 75, 44-pp, covers 100 amp systems. Each includes special section on installation planning and procedure, mounting. Feedrail Corp.

331 Rubber Power Cable—This 32-pp catalog contains detailed information on design features, insulations, and performance highlights of butyl rubber power cable. Includes data on available constructions, ampacity and installation data. Anaconda Wire & Cable Co.

332 Instrumentation Cables—Featured in 8-pp Bulletin RCD-400 is a line of instrumentation cables for telemetering, data recording, circuit control testing, and electronic computers. Cable design and selection of insulating and jacketing materials is covered. Rome Cable Corp.

333 Rigid Steel Conduit—Features and advantages of company's rigid steel conduits, electrical metallic tubing, and flexible metallic conduits are illustrated and described in 20-pp Catalog 603. Tables of dimensions and weights, and other data given. National Electric Products Corp.

334 Protective Equipment Guide—Form SPD is a 24-pp handbook on selection of protective devices for electric circuits, motors, appliances and apparatus, and is based on 1959 National Electrical Code. Besides providing suggestions on how to select right kind of protections, booklet provides wiring diagrams, motor tables. Bussmann Mfg. Co.

335 Electrical Equipment—Condensed Catalog No. 9 contains 48-pp of desriptive data on company's line of electrical products, including conduit bodies, conduit fittings, connectors, ground fittings and EMT fittings. Dimensional data and features are shown. Gedney Electric Co.

336 High Voltage Control—This 16-pp booklet discusses general features of company's high voltage control equipment. Details individual characteristics of both full and reduced voltage types of high voltage control for squirrel cage, synchronous and wound rotor motors. Ratings, dimensions listed. Cutler-Hammer Inc.

337 Electrical Equipment Digest—Electrical equipment illustrated and described in 160-pp Catalog Digest 142, includes load centers, circuit breakers, low voltage control, fusible service equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters. Square D Co.

338 Electrical Equipment—Collected in this bound catalog is a series of bulletins on company's line of electrical equipment, including electric motors, generators, motor-generator sets, switchboards and controls. Cutaway views showing details of design and construction are included, also engineering and specification data. The Ideal Electric & Mfg. Co.

339 Control Batteries—Twelve pp Bulletin CP-539 describes batteries for control, switchgear and auxiliary power. Construction details are illustrated and described, and specifications are given as well as discharge characteristics curves. C & D Batteries, Inc.

340 Battery Technology—Bulletin GB-1896 is a 36-pp handbook of technical instructions and engineering data on the care of motive power storage batteries. Covers all phases of lead acid battery theory, operation and maintenance. Captioned line drawings are included, as well as basic information on specific gravity changes, charging and discharging cycles, plate composition. Gould-National Batteries, Inc.

341 Building Wire—Proper selection of electrical conductors in building construction and modernization is the purpose of 40-pp Bulletin B-1-59. Various types of wire and cables are described and detailed technical tables giving conductor designations, operating temperatures, voltage ratings, construction and other data are included. General Cable Corp.

342 Wiring Devices—Catalog 60, about 80-pp, presents ordering data on wiring devices including a wide range of switches, convenience outlets, lampholders, fluorescent devices, cord connectors, adapters, wall plates, accessories etc. Fully illustrated with photos, catalog provides condensed information on features, dimensions, applications. Pass & Seymour, Inc.

343 Renewable Fuses—The first section of 12-pp Bulletin 1320, discusses construction and application features of two types of renewable fuses—ferrule and knife-blade—as well as renewal links to facilitate replacement. Salient features are highlighted by sectional and cutaway drawings. Ordering information and specifications of the 250-v and 600-v fuses are covered in the second section. Federal Pacific Electric Co.

344 Cable Troughs—This 12-pp catalog offers a simple solution to any design problem of change of direction or elevation with a complete set of standard fittings, horizontal elbows, inside and outside vertical elbows, ties, crosses, covers and many special devices. The Globe Co.

345 Commutator Maintenance—This commutator and slip ring maintenance data file contains information on methods and procedures for more efficient commutation. Individual bulletins cover brushes, sparking, picking, dragging and other troubles, maintenance tools and how to use them. Ideal Industries, Inc.

346 For Rewound Motors—Eight-pp Booklet B-7622 describes a solventless epoxy encapsulation-type insulation for rewound motors. Outlines physical and chemical properties and describes typical applications. Westinghouse Electric Corp.

LIGHTING, COMMUNICATIONS

348 Industrial Lighting Data—New specifications for incandescent and mercury vapor uplight porcelain enamel and aluminum high mounting units, "all-white" incandescent specs and many upward revisions in specifications for industrial fluorescent fixtures are included in 44-pp 1959 edition RLM Specifications Book. Contains complete specifications for 14 basic types of most widely specified industrial lighting units. RLM Standards Institute, Inc.

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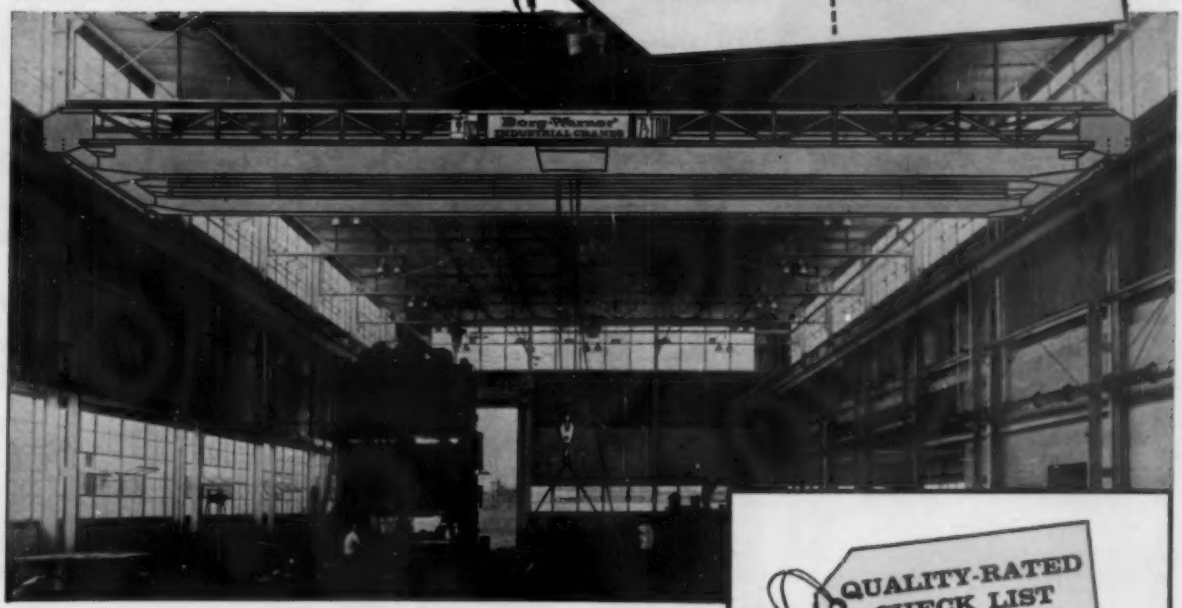

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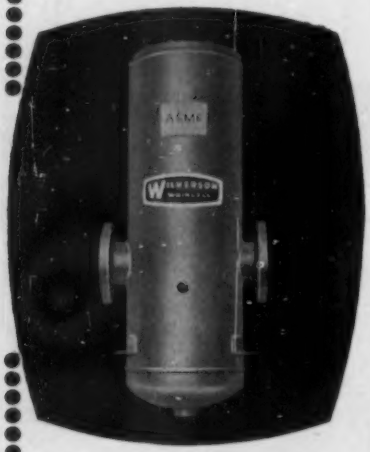

Exclusive features of NEW Wilkerson "WHIRLFLO"

★ Metal bowl or transparent bowl which permits you to see condition of cartridge and when to drain.

★ "Micro-Pruf" cartridge completely removes oil and particles as small as 3 microns—lasts 4 times longer.

★ 200% greater CFM capacity. Maximum pressure 250 PSI with metal bowl.

Put the "WHIRLFLO'S" double-barreled action to work for you.

1. Centrifugal force from special baffle vane sends contaminants to walls of cylinder away from cartridge, from where they drain into sump.

2. Then separated air flows through "Micro-Pruf" cartridge. This 2-stage action cleans better and adds months of life to cartridge.

SAVE
on maintenance and operation.

1. The cartridge lasts 4 times longer than others.
2. Cartridge is easily replaced by removing one nut while unit remains on pipe line.
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WILKERSON CORPORATION

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DATA FILE

(Begins on page 276)

349 Incandescent Lighting—The 24-pp "Incandescent Lighting Guide Book" features sections on the general advantages of incandescent lighting, the history of incandescent lamp developments, and includes chapter on basic types, bulb shapes, sizes, glass types and finishes, and bases. Sylvania Electric Products Inc.

350 Emergency Lighting—Twenty-pp Publication 243A features emergency lighting systems for commercial, industrial and other types of buildings. In addition to describing the systems, catalog contains complete information and specifications on all components. The Standard Electric Time Co.

351 For Hazardous Locations—Explosion-proof and dust-ignition-proof mercury vapor lighting fixtures are described in Bulletin 2705. Lists explosion-proof fixtures with five styles of reflectors, all available with or without guard, two styles of dust-ignition-proof units. Crouse-Hinds Co.

352 Lighting Supports—Channel type lighting supports for installing wiring and electrical lighting fixtures are described in 8-pp Bulletin G-2. Recommendations for applications, installation procedures, features and data are covered, and photos, dimensional data and specifications included. Steel City Electric Co.

353 Lighting Maintenance Tips—Principles and advantages of good lighting practice are presented in this 48-pp lighting maintenance manual. Much useful information has been added to this revised edition, including a guide to trouble shooting fluorescent installations, a section on planning group replacement of lamps, cleaning. Champion Lamp Works.

354 Communication System—Featured in this bulletin is a transistorized communication system designed to provide communication between two or more persons or departments regardless of distance or surrounding noise conditions. Operating features detailed. Gai-Tronics Corp.

355 Signal Equipment—Tips on how to select suitable signals for any specific operations are offered in Bulletin 100. Describes horns, bells, warning lights, other signal equipment. Specifications, photos, wiring diagrams, dimensions, audibility rating charts, electrical characteristics. Federal Sign & Signal Corp.

INSTRUMENTS, CONTROLS

356 Precision Instruments—Catalog G1 contains 32-pp of comprehensive information on indicating, recording and controlling instruments. Contains potentiometers, pyrometer supplies, descriptive and illustrative data on systems and components, null indicators, amplifiers and oscillographs, pressure gages, flow and liquid level meters, pneumatic remote transmission, thermometers, panelboards, valves, diaphragm motors, motor and dampers, switches, etc. Minneapolis-Honeywell Regulator Co.

357 Liquid Level Indicators—Bulletin RI-1825 contains 24-pp of detailed information on a remote indicator for boiler water levels, its temperature compensating unit and pressure compensator accessory mechanisms, an associated automatic control unit for operating indicator. Covers advantages, details of operation. Yarnall-Waring Co.

359 Burner Control Systems—Folder 5803-A describes pre-wired, panel control systems for automatic oil, gas or dual-fuel burners in industrial and other boiler installations. Included are dimensions, illustrations, selection chart for identifying panel assemblies. Iron Fireman Mfg. Co.

360 For Limited Panel Space—Bulletin 532 describes Model 216 indicator used with company's automatic tank contents gage. Bulletin contains a full illustration of indicator which, although occupying a small space, has a scale 20 in. long. The Liquidometer Co.

361 Mercury Bulb Elements—Bulletin 851 describes the various types of mercury bulb elements which are the heart of all company's instruments. Basic principles, type and temperature ranges, plungers and interchangeability, element plunger types covered. The Partlow Corp.

FANS, VENTILATING, AND AIR CONDITIONING

362 Mechanical Draft Fans—Eight-pp Catalog 1361 describes centrifugal fans designed for handling abrasive gases at high temperatures. Full physical data are given, as well as a list of accessories. Sturtevant Div., Westinghouse Electric Corp.

363 Duct Fans—Bulletin A-114A, 12-pp, presents belt-drive fans, from 12 to 60 in., with adjustable driver sheaves which permit quick adjustment of fan speed. Also gives dimensions, performance data and construction details on direct-drive duct fans in the same size range, the Bi-Pass duct fan with the motor mounted in a tunnel out of the air stream, and a reversible duct fan which moves air in either direction. Hartzell Propeller Fan Co.

364 Industrial Fans—Fundamental data relating to capacities and construction of company's line of industrial fans incorporating a universal discharge are presented in 28-pp Bulletin L-5. Includes rating tables giving volumes of air delivered, rpm, horsepower at various static pressures, and outlet velocity and velocity pressures, as well as tables of correction ratios for deviations from standard atmospheric conditions. Lehigh Fan & Blower Div., Fuller Co.

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USING A

PACKAGE AIR PREHEATER

Fuel savings alone pay for it in two years; installation costs cut by pre-assembly – –

Savings come in pairs at Clearwater Finishing Co., with the installation of their new Package Air Preheater. This is why:

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★ New, patented 'Sexauer' SELF-LOCK screws have imbedded expanding NYLON PLUG. They lock at required depth AUTOMATICALLY, hold washers firmly! Made of MONEL, they are rustproof, non-corroding. Heads can't twist off. Screw slots can't distort.

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SEXAUER

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DATA FILE

(Begins on page 276)

365 Power Exhausters—Bulletin 58-B contains 12-pp of detailed information on company's line of power exhausters. Construction features are illustrated and described, and performance and dimensional tables are given. Jenn-Air Products Co., Inc.

366 Propeller Fans—Twenty-pp Catalog 159 gives detailed information on a complete line of self-cooled motor propeller fans for a variety of ventilation requirements. Includes information on fan selection, construction data and dimensions, performance and accessories. Ilg Electric Ventilating Co.

367 Air-Moving Equipment—Bulletin DB 45, 20-pp, contains detailed information on company's line of roof ventilators, bifurcators, axial flow vent sets, and air jets. Bonded performance ratings are listed on tables, and dimensional data included. DeBothezat Fans Div., American Machine and Metals, Inc.

368 Air Engineering—Bulletin E-57 is a 24-pp air engineering data file covering engineering and test facilities for propeller fans, specifications, construction, maintenance, and installation. Tables for estimating air-handling requirements are provided. Aerovent Fan Co., Inc.

369 Ready Units—Catalog 517 provides 36-pp on complete, ready-to-run centrifugal fan equipment. Capacities 400 to 13,000 cfm, belt and direct driven units. Dimensions included. Clarage Fan Co.

370 Zone Control Cabinets—Air conditioning zone control cabinets are described and illustrated in 20-pp Bulletin AC-220. Separate sections with tables, curves and sketches cover proper unit selection, physical data, dimensions, fan performance and coil ratings for water cooling, direct expansion, hot water and steam. Buffalo Forge Co.

371 Air Conditioning Units—Bulletin 786 contains 54-pp of selection data on air conditioners, including capacities, standard arrangements, dimensions, etc. Steps in selection of basic unit and components are outlined. First pages are devoted to choosing the physical size based on air capacity and face velocity requirements, while succeeding pages concern themselves with heating and cooling requirements, control. American Air Filter Co., Inc.

372 For Air Conditioning—Featured in 8-pp Bulletin S-290 is company's line of products for air conditioning, as well as products for heating, ventilating and heat transfer. Installations shown. The Trane Co.

373 Liquid Absorbent—Bulletin 140 describes a hygroscopic liquid designed for removing moisture from

Second in a Series of Advertisements Advertising You!

In the November, 1959 issue of PLANT ENGINEERING, we presented the first of a series of advertisements designed to acquaint the general public and general management of the important part played by the plant engineer in today's economy. The first advertisement, as does this one, appeared in the *New Yorker* magazine.

The 400,000 circulation of the *New Yorker*, including as it does many industrial, commercial and financial leaders, makes it an ideal display case for carrying the message of the plant engineer. Designed by Noel Martin, one of America's leading graphic designers, this series of ads will do much to dramatize the statements made by industry leaders.

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Plant Design and Construction
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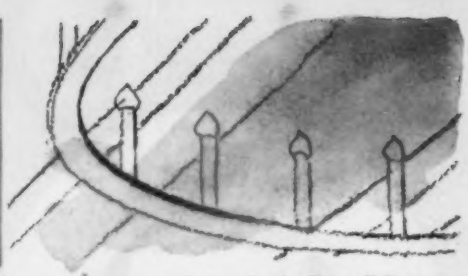
PLANT ENGINEERING magazine dedicates this series to its readers, the thousands of plant engineers who plan, purchase and maintain America's industrial plants and the equipment and supplies they use.

Neil Maslen

"When we talked about the Plan person-to-person, participation jumped 30%!"



In our company we've made the Payroll Savings Plan available for some time. I thought, naturally, that we had a large participation. But when I checked up a few weeks ago I discovered that only about 22% of our people were making use of the Plan. It's so easy to say, "Sure, this is a fine idea, and I'll sign up next payday."

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DATA FILE

(Begins on page 276)

air. Operation of company's air conditioner using the liquid absorbent is illustrated and a chart showing water vapor equilibrium is included. Niagara Blower Co.

HEATERS, HEATING

374 Unit Heaters—Performance and application information on company's line of unit heaters for steam and hot water heating systems is presented in 16-pp Catalog 159. Steam and hot water performance data tables are included, as well as dimensional data, mounting suggestions, points on selecting and locating unit heaters. Modine Mfg. Co.

375 Thermo-Panel Coil—Technical Data Bulletin 355 is a 48-pp guide to company's panel coil for heating and cooling applications. Features of materials and design are illustrated and described, and detailed specification and dimension tables, heat transfer coefficient charts, capacity tables included. Dean Thermo-Panel Coil Div., Dean Products, Inc.

376 For Heating Systems—A great deal of helpful information on heating systems is presented in Engineering Data Manual 2695, 28 pp. Detailed illustrated information pertaining to heating problems is given. Besides covering heating terminology there are sections on steam data, water properties, piping data, weights and measures. Dunham-Bush, Inc.

377 For Radiant Heating—Eight-pp "Radiant Heating Slab Construction" is an illustrated report on accepted installation procedures for radiant heating systems. Arranged in order of preference are sketches of various types of construction. Each shows position of wrought iron pipe coils in the concrete slab, as well as relationship of coils and slab to structural features of construction. A. M. Byers Co.

VALVES, TRAPS, PIPING

379 Stainless Steel Valves—Corrosion resistant stainless steel valves are featured in 32-pp Catalog 59SS. Features of design and construction are shown through cutaway views, and advantages of stainless steel in withstanding corrosive attack of chemicals and atmospheres are detailed. Jenkins Bros.

380 Industrial Valves—Bulletin 507X illustrates and describes company's line of industrial valves for control of air, gas, liquids and solids. Features photos and descriptive detail on a variety of valves, including butterfly valves, water valves, slide valves. W. S. Rockwell Co.

381 Check Valves—Detailed information on a line of silent check valves designed to combat surge and water hammer problems is presented in this 20-pp bulletin. Photos of typi-

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with ROCKWELL "D-D" VALVES
you're Sure-you're Safe!

The BEST for
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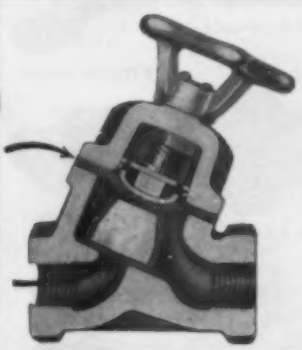
Service



OPERATION Disc absorbs action of fluid flow and pressure, and cuts off fluid on closure. Diaphragm merely seals mechanism from valve body. Failure of diaphragm does not prevent closing the valve. Hence—longer diaphragm life—less maintenance. Oversized ports for higher capacity.

CONSTRUCTION Valve bodies of cast iron, stainless steel, or lined with rubber, Neoprene, Penton, other plastics or glass. Diaphragm discs of rubber or Neoprene. Flanged — ½" to 6" sizes; screwed or union ends — ½" to 2" sizes. Write for Bulletin 800C.

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A HIGH QUALITY LINE OF MALLEABLE HOUSED BEARING UNITS AND BEARINGS AT A COST THAT IS WARRANTED ON YOUR MACHINE!

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LF 3-BOLT FLANGE UNIT

Available in pillow blocks and two or three bolt flange units for flush or recessed mounting. All units in the "L" Series available with the new SEALMASTER contact type seal.

LP PILLOW BLOCK

LF FLANGE UNIT

LFT FLANGE UNIT

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SEALMASTER

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A DIVISION OF
STEPHENS-ADAMSON MFG. CO.
89 RIDGEWAY • AURORA, ILL.
PLANTS LOCATED IN: LOS ANGELES, CALIF. CLARKSDALE, MISS. • BELLEVILLE, ONTARIO

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DATA FILE

(Begins on page 276)

cal installations are included, as well as engineering data and flow charts. Combination Pump Valve Co.

382 Butterfly Valves—Bulletin 10 contains detailed selection information on a rubber seat butterfly valve designed to mount between pipe flanges. Contains tables of maximum valve line pressures for various cylinder operating pressures, water flow characteristics of butterfly valves, gas flow characteristics, material selection chart. Henry Pratt Co.

383 Safety, Relief Valves—Twelve-pp Circular 502 describes applications, performance, sizes and installation of bronze safety and relief valves for steam, air, gas, water, oil and other liquids. Includes tables of relieving capacities. The Lunkenheimer Co.

384 Magnetic, Motorized Valves—Within its 24 pages Catalog V-58 illustrates and lists specifications of magnetic and motorized valves for use with air, water, gas, steam, oil and refrigerants. Also included are solenoid coil rating tables. Another feature consists of two flow charts—one for liquid, the other for compressible fluids. The Mercoid Corp.

385 Steam Trap—Bulletin 257 describes features and operation of a steam trap which uses the kinetic energy of steam to close the valve. Operation details are illustrated and capacities tabulated. Sarco Co., Inc.

387 Manual on Traps—This 40-pp engineering manual is designed to assist in the sizing, specifying and selection of steam traps and other fluid specialties. Includes steam trap selection guide, explanation of four basic types of traps and how they perform their function, four steps to follow in sizing a steam trap, table of factors and detailed instructions on how to select steam traps for over 45 major classes of equipment. The V. D. Anderson Co.

388 On Steam Traps—Catalog K is an enlarged 48-pp manual and steam trap catalog. New material provided includes open float and thermostatic traps, pipe strainer to 6 in. in steel and semi-steel, and in helpful steam pipe sizing tables. Discusses fundamentals of good trapping, trap selection, installation, testing, repairs. Armstrong Machine Works.

389 Glass Pipe and Fittings—Corrosion-resistant qualities of this Pyrex brand glass pipe and fittings which make it suitable for use under corrosive conditions are described in 44-pp Bulletin PE-3. Operating temperatures, physical characteristics, installation procedures are covered and specifications and dimensional drawings given. Corning Glass Works.

390 PVC Pipe, Fittings—This 12-pp bulletin contains latest technical

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information on polyvinyl chloride pipe and fittings, including advantages and properties, general characteristics and applications, physical flow rate charts and complete specifications. Also included is a chemical resistance chart of various reagents and their effect. Mueller Brass Co.

391 **UPVC Pipe, Fittings**—Technical data and installation information on unplasticized polyvinyl chloride pipe are provided in 24-pp Booklet TTP-119. Also gives specifications for threaded and socket types of UPVC fittings, valves and flanges, or normal and high-impact material. Tube Turns Plastics, Inc.

392 **Process Piping**—Chemical-resistant plastic pipe, fittings and valves are featured in 16-pp Bulletin CE-80. Advantages are detailed, and installation procedures outlined. Technical data tables are also included. American Hard Rubber Co.

393 **Reinforced Plastic Pipe**—Detailed information on characteristics and applications of reinforced plastic pipe is presented in the 16-pp Bondstrand Bulletin. Temperature and pressure curves are included, along with dimensional data and diagrams. Amercoat Corp.

394 **Swivel Joint**—Features and advantages of company's swivel joint which permits fast, easy packing interchangeability are illustrated and described in Bulletin 1258A. Table of specifications and properties are included, as well as dimensional data and diagrams. Chiksan Co.

395 **Fluid Line Coupling**—Catalog 100 contains data sheets describing company's line of quick-connective fluid-line couplings for pneumatic, hydraulic, oxygen, acetylene, steam, various gases and liquids service. Photos and dimensional diagrams are included. The Hansen Mfg. Co.

FILTERING

396 **Filter Media Selection**—Twelve-pp Bulletin PUR-66D contains a chart designed to guide selection of proper engineering materials and filter media for given types of corrosive conditions. The chart lists filter media for varying concentrations of more than 125 corrosive agents. Purolator Products, Inc.

397 **Filters for Industry**—Illustrated and described in this product bulletin are filters for a variety of applications in industry. Among those covered are liquid filters, intake filters, pipe line filters, dry and viscous panel filters, precipitators, Electro-Staynew mist collector, and a dual action filter. The Dollinger Corp.

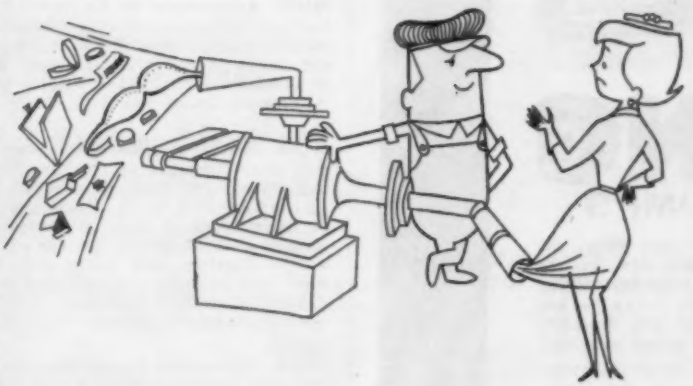
CONSTRUCTION

398 **Foundation Pipe Piles**—Comprehensive information on Taylor Forge spiral-weld foundation pipe piles is presented in 24-pp Form F-5677. In addition to detailed specifications, the illustrated booklet de-

WEMCO® the INCREDIBLE Torque-Flow Pump

pumps almost everything

(what will go in will come out)



secret: recessed impeller; continuous open passage

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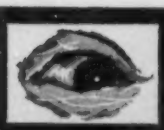

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WEST

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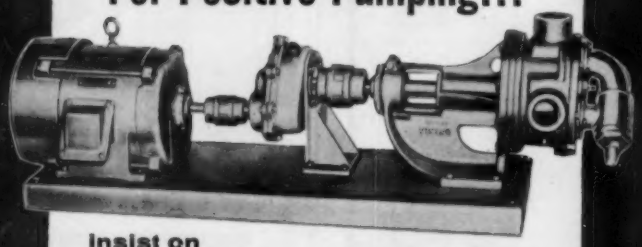

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See Our Catalog in Sweet's Plant Engineer's File

For more facts circle 681 on Reply Card

DATA FILE

(Begins on page 276)

scribes a number of pipe-pile installations. L. B. Foster Co.

399 Steel Buildings—Advantages of building with steel are illustrated and described in colorful 12-pp Catalog B-16359. Various types of building constructions are illustrated, and details of construction shown, along with dimensional data. Armco Drainage & Metal Products, Inc.

400 Insulating Panel—Application information and design data for Asbestone insulating panels are presented in 28-pp Manual, File 19-D. Covers construction and characteristics of panels, exterior curtain wall applications, interior applications, painting and decorating panels, and specifications. National Gypsum Co.

401 Fir Plywood—This 34-pp construction guide contains full-page structural drawings providing basic information on types, grades, and applications of fir plywood. Booklet covers information on floor construction. Douglas Fir Plywood Assn.

402 Replacement Glazing—Twelve-pp Booklet PL-251 gives detailed information on glazing industrial and other buildings with flat panels of the acrylic plastic, Plexiglas. Written for plant engineers concerned with frequent breakage of windows or other glazing problems, this practical booklet gives properties of this sheet. Plastic Dept., Rohm & Haas Co.

403 Fire-Resistant Resin—Structural panels, skylight louvers, chemical ductwork and other products made of Hetron, permanently flame-resistant polyester resin are covered in this illustrated bulletin. Table lists characteristics. Durez Plastics Div., Hooker Electrochemical Co.

404 Aluminum in Colors—This bulletin introduces Alcoa's Alumalure colored aluminum architectural building sheet products, a complete line of sheet products offered in 11 colors. Aluminum Co. of America.

405 Resilient Floors—Properties and characteristics of resilient flooring are covered in comprehensive 52-pp Catalog File 23-G. Offers a guide to basic types of vinyl flooring materials, characteristics, gauges of resilient flooring, and other technical data, and includes methods and techniques of installation and detailed specifications. Armstrong Cork Co.

406 Corrosion-Proof Flooring—Bulletin 120-A describes a monolithic corrosion-proof flooring material developed for application over concrete to protect against acids, alkalis and solvents. Specifications are included. The Ceilcote Co., Inc.

407 Non-Slip Flooring—Algrip, an abrasive rolled steel floor plate described as non-slip even on steel

PAGE

FENCE

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inclines, is the subject of Booklet AL-29, 8-pp. Discusses safety features. Alan Wood Steel Co.

408 Steel Floor Plate—Skid resistance and other advantages of USS multigrip rolled steel floor plate are stressed in this illustrated bulletin. Also gives dimensions, load data. United States Steel Corp.

409 Grating, Stair Treads—Bulletin 1105, 16-pp, describes construction and design advantages of company's line of interlocked grating and stair treads. Contains detailed information, photos, drawings and engineering data on rectangular, diagonal, radial and serrated gratings, stair treads, a moring. Dravo Corp.

410 Steel Grating—Featured in 16-pp Bulletin 14R are company's steel grating and stair treads for a variety of industrial applications. Pictures of typical installations are included. Kerrigan Iron Works, Inc.

411 Wire Mesh Partitions—Advantages of company's wire mesh partitions for closing off restricted areas are told in this product bulletin. Specifications are included, as well as photos. Phoenix Wire Works, Inc.

STORAGE, SHOP EQUIPMENT

412 Guide to Shelving—To assist plant engineers in selecting proper shelving for all storage requirements, 64-pp Catalog 30 offers detailed suggestions for correct shelving and storing materials, loose and packed parts, record files. Shop equipment and storage cabinets are also described and instructions included for planning of stockrooms. Deluxe Metal Products Co. Royal Metal Mfg. Co.

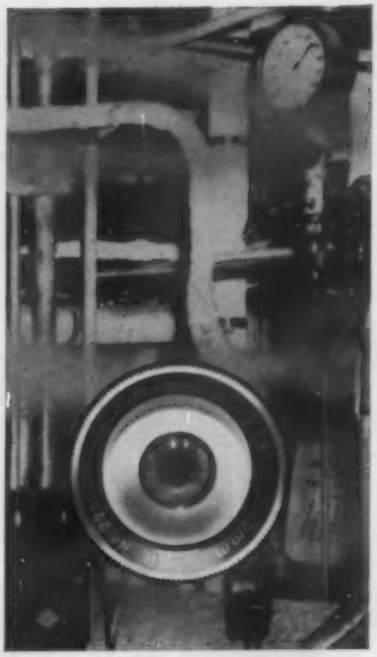
413 Steel Equipment—Catalog 100 H contains 92-pp of detailed information on steel cabinets, folding chairs, work benches, tool stands, shelving, tool storage, lockers, coat racks, filing cabinets, revolving bins, others. Includes dimensions and specification, as well as installation photos. Lyon Metal Products, Inc.

414 Storage Racks—Bulletin R-400, 12-pp, illustrates and describes a wide variety of storage racks manufactured by the company. Application drawings, photos and diagrams are included. Chicago Tramrail Corp.

TOOLS, WELDING, AND MACHINE SHOP EQUIPMENT

415 Pipe Tools—Ordering and application information on Rigid pipe tools is provided in 16-pp illustrated Catalog 7596R-6. Wrenches, cutters, threaders, reamers, vises, and others are pictured and described, also power drives. The Ridge Tool Co.

416 Industrial Tools—Information on a complete line of industrial tools, including 500 new types and sizes never before offered, is presented in 120-pp Catalog 57. Included are complete lines of wrenches, socket



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on hazardous atmospheres is a continuous job for GPL closed-circuit TV in the propane de-asphalting pilot unit at Esso Research and Engineering.

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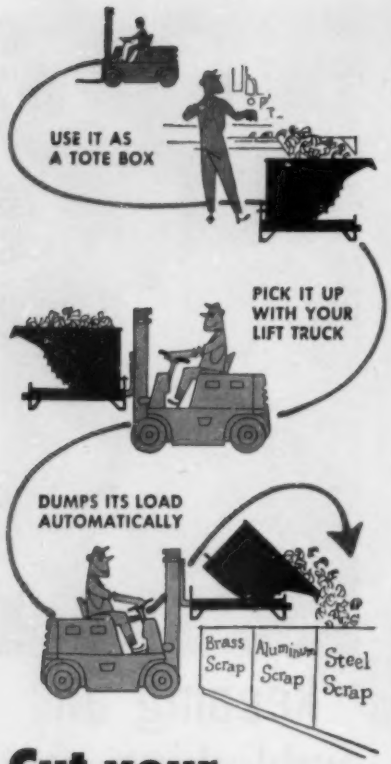

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DATA FILE

(Begins on page 276)

wrenches, drop forged clamps, tool holders, set up and hold down tools, cutting tools and pipe tools. Photos, drawings and numerous charts aid selection. Armstrong Bros. Tool Co.

417 Portable Electric Tools—Form 10 features a complete line of portable electric tools including drills, screw-drivers, impact wrenches, magnetic drill presses, sanders, grinders, hammers, holesaws, and forged tools. The Black & Decker Mfg. Co.

418 Industrial Wrenches Hand Tools—Tools for production lines, maintenance work and product servicing are presented in 156-pp Industrial Catalog 58-I. Loaded with pictures and tool facts, book describes in detail the complete line of over 4,000 tools—including chests and rollcabs, wrenches and sockets of all types, screwdrivers, pliers, pullers, etc. Snap-on Tools Corp.

419 Air Tools—The growing use of air tools for a variety of applications in building and industry is covered in 8-pp Bulletin AT-116B. Selection data for air tools and a trouble chart are included. Le Roi Div., Westinghouse Air Brake Co.

421 Power Tool Guide—Thirty-pp Catalog 105 describes 70 portable electric tools and kits with over 400 accessories. Buying guide includes pictures of tools and their applications with complete specifications and prices for electric saws, sanders, drills, planes, routers, shapers, and combination tools. Porter-Cable Machine Co.

422 Power Tools—Comprehensive information on power tools for industrial production, plant maintenance, construction, wood and metalworking is presented in the 58-pp edition of their 1959 product guide. Specification and applications data on such items as power saws and saw blades, sanders, grinders, brushes, drills, files, grinding wheels, screwdrivers included. Skil Corp.

423 Shop Equipment—Work benches, tool stands, shelving and other pressed steel equipment for the shop, laboratory and assembly line are shown in 8-pp Form 2299. Construction features and specifications of size, top material, equipment variations. Standard Pressed Steel Co.

424 Vibration Control—Bulletin 59-05 contains shock and vibration control data. Various types of isolation mounts for machinery, commercial applications, and test equipment are listed. Barry Controls, Inc.

425 Data for the Shop—"Fluids and Facts for Metal Working" is a pocket-size booklet of about 44-pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oils and paste compounds, and prevention of dermatitis. Coversion tables, steel numbering systems, machinability ratings. Standard Oil Co. (Ind.)

MAINTENANCE

427 Protective Coatings—This 38-pp comprehensive treatise (Form 259) on rust and corrosion control by protective coatings contains a gate-fold spread showing actual color standards of company's primers and top coatings. Covering water resistant, heat resistant, floor coatings, heavy-duty chemical resistant coatings, galvanized metal coatings, wire fence roller coatings, and quick-dry coatings, booklet contains full-color application photos and 110 color chips, and a technical section. Rust-Oleum Corp.

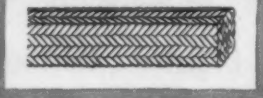
428 Protective Coatings—Described in 8-pp Form PC 50 are industrial protective coatings for a variety of specific applications. Characteristics of a coal tar-epoxy resin coating, Gilsonite-asphalt matics, and cold applied coal tar coatings and application methods are fully described and advantages detailed. Pittsburgh Coke & Chemical Co.

429 Metal Treatment—Featured in this product bulletin is a metal treatment designed to be applied directly on rusted metal to stop rust action and provide a sound base for maintenance paint. Advantages described. Rusticide Products Co.

430 Industrial Floors—Many types of industrial floors are studied and

FOR HIGH OR LOW SPEED ROTARY OR RECIPROCATING MOTION . . .

PALMETTO.
Interwoven
Asbestos
Packings



• For the ultimate in durable packing construction choose from the nine *interwoven* packings in the Palmetto Self-Lubricating Packing line . . . Combines density of braid over braid—flexibility of plaited. Send for your copy of SLP-659 that gives service conditions, applications, prices, etc.

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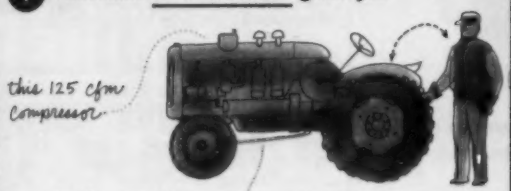

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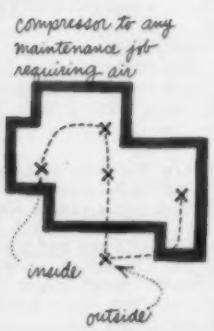

3 rest of time

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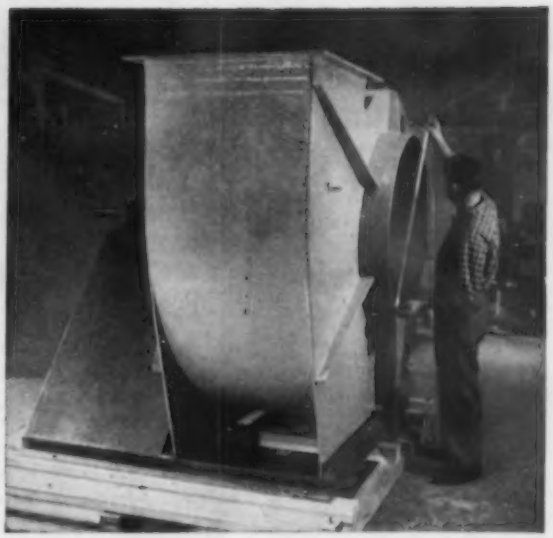

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Extremely wide range of standard sizes including both centrifugal and axial designs, fabricated of our proven, corrosion-free **Rigivin** (rigid vinyl) and **Rigidon** (reinforced plastic) construction, speeds delivery and minimizes engineering costs.

Let the Heil corrosion engineers, with more than 29 years of successful experience designing and fabricating corrosion resistant equipment, help you select the size and type of plastic fan that will give you the best service under your particular corrosion conditions.

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. . . gives most accurate temperature control

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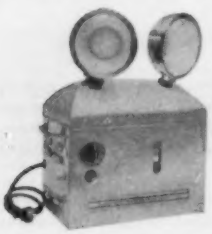

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* BETTER PROTECTION . . . every component of every unit is specially engineered for emergency lighting . . . for reliability
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CARPENTER MFG. COMPANY

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DATA FILE

(Begins on page 276)

their soil removal problem analyzed in this 8-pp booklet, complete with charts, list of cleaning compounds, and descriptions of cleaning methods. Methods of sanitizing, stripping wax and paint, and of absorbing liquids discussed. Oakite Products, Inc.

431 **For Overhead Maintenance**—Bulletin G205RR, 8-pp, tells how to control costs when maintenance goes above arm's reach—for painting and cleaning, electrical work, etc. Pictures a variety of scaffolding arrangements. Provides brief product information on steel and aluminum scaffolding, ladders. The Patent Scaffolding Co., Inc.

432 **Pyramid Ladders**—Catalog 158, 20-pp, describes a line of pyramid-design step ladders, as well as hydraulic lifts and fixed or adjustable-level work platforms for above-floor working safety. Illustrates 35 new models of ladders for working heights up to 15 ft, gives detailed specifications and shows typical uses. Ballymore Co.

433 **Window Washing Systems**—Illustrated and described in 16-pp Booklet 2022-A are window washing systems for building maintenance. Engineering details on the Tramrail equipment are presented, as well as photos of typical installations. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

SLINGS, CHAINS, WIRE ROPE AND FITTINGS

434 **Sling Handbook**—Form SL-3 is an illustrated 40-pp reference book covering more than 80 subjects on slings and fittings. Included in this revised edition is reference information condensed into handy chart form on sling types, dimensions and rated loads. Union Wire Rope Corp.

435 **Sling Chain Handbook**—Illustrated Data Book 100. 32-pp, presents "how to do it" information on sling chains—from ordering to care, use and inspection. Contains diagrams, charts and tables on standard and special styles of the sling chains. Columbus McKinnon Chain Corp.

436 **Drop Forged Fittings**—Comprehensive data on company's line of drop forged fittings for wire rope and chain are presented in 40-pp Catalog 950-2. Includes specifications, dimensions, rated capacities and weights. Also announces range of sizes and capacities in many of items listed, as well as new products, including clips. Crosby-Laughlin Div., American Hoist and Derrick Co.

MATERIALS HANDLING

437 **Electric Hoists**—Twelve-pp Bulletin DH 133D describes Speedway electric hoists of 500- to 4000-lb capacities. Fully illustrates and ex-

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Get the heaviest duty wearing surface for foot and wheel traffic with these Flintkote Flooring Products —all are trowel finished. • Asphalt Mastic Flooring (FLINTMASTIC†) • Latex Industrial Flooring • Epoxy Flooring—for problem floors.

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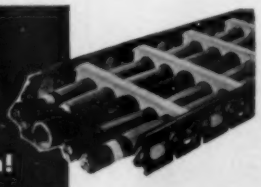
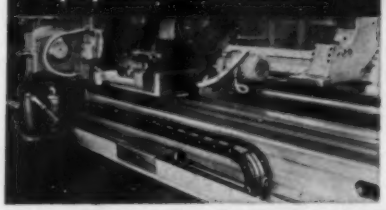
POWERTRAK
Increases Cable, Hose Life on your Equipment-in-Motion!





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Your equipment will benefit with POWERTRAK—amazing invention for carrying power cable or hose to and with equipment in motion. Offers many advantages on machine tools, lathes, grinders, planers, presses, cranes and others. Protects power cables, oil, gas, and air hoses against wear from bending, crushing, abrasion, friction, pulling stresses and strains. Avoids machine downtime and cable or hose replacement expense.

POWERTRAK saves space, permits more flexibility in machine design. Handles multiple cable and hose up to 2½" diameter, up to 70 feet of travel, at moving speeds up to 300 feet per minute.

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if OSPHO°—applied on rusted metal does not . . .

1. KILL THE RUST

2. STOP FURTHER RUST ACTION

3. PROVIDE A SOUND BASE FOR PAINT

Brush off loose rust. Apply OSPHO right over remaining rust. Water-thin, OSPHO soaks through the rust, flows into hard-to-reach spots. One application kills *all* the rust . . . stops further rust action. Let dry, then apply regular maintenance paint. OSPHO makes paint jobs last much longer.

OSPHO is *not* a primer, *not* a paint. It is a phosphoric treatment. Brushed or sprayed on rusted metal, it changes rust (iron oxide) into iron phosphate—an inert, hard surface ideal for painting. OSPHO also insures tight adhesion of paint on new metal—including aluminum and galvanized.

Colorless, non-toxic, non-flammable, OSPHO gives excellent coverage—a gallon treats up to 600 sq. ft. Repeat orders from industry over 12 years prove its worth.

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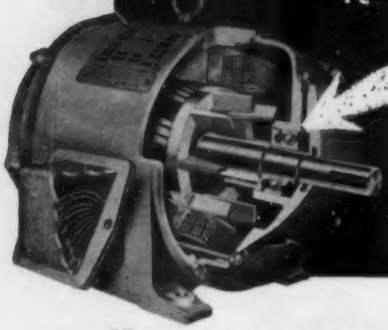

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the ideal valve for new installation and economical replacement. Sizes 4" thru 20", 0-150#, variety of manual and automatic operators.

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DATA FILE

(Begins on page 276)

plains design features and gives details on suspensions and conducting systems. Clearance data included. Wright Hoist Div., American Chain & Cable Co., Inc.

438 Electric Hoists—Six-pp illustrated Bulletin 905 describes R&M Type J electric wire rope hoists in capacities of ¼, ½, 1 and 2 tons. Shows complete specifications including mounting options and sectional drawing. Hoist & Crane Div., Robbins & Myers, Inc.

439 Improved Hoist—Complete information on five models of a new sealed ratchet lever hoist is provided in Bulletin ADH-78. Lists specifications and features of these hoists ranging from ¾- to 6-ton capacities. Coffing Hoist Div., Duff-Norton Co.

440 Sheet and Coil-Lifters—Bulletin SL-30, 16-pp, illustrates and describes various types of standard and semi-special lifters for one-man or automatic handling of sheet and coil stock. Advantages and design features are detailed and dimensions included. Cullen-Friestedt Co.

441 For Lifting, Pulling—Bulletin 146-G describes a portable, lightweight puller designed for lifting and pulling in any position. Operation and maintenance details are given, as well as specifications and other data. Chisholm-Moore Hoist Div., Columbus McKinnon Chain Corp.

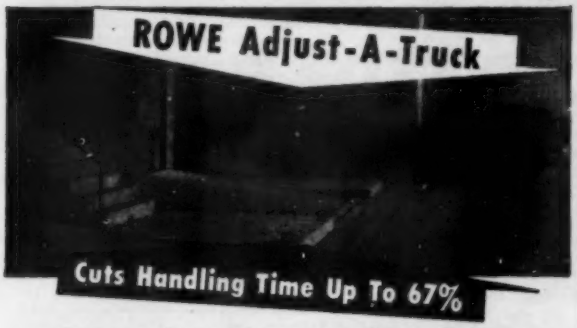
442 Air Hoists, Cylinders—Details on company's line of air hoists and cylinders for lifting, lowering, pushing, pulling, and opening or closing are presented in this Product Bulletin ABS-5. Engineering data table lists capacities. Curtis Mfg. Co.

443 Load Handling Equipment—Illustrated and described in 20-pp Bulletin 15025 is load handling equipment, including portable electric hoists, I-beam trolleys, differential chain hoist, trolley hoists, lever-operated hoists, electric hoists, driven trolleys, air hoists, jib assemblies and bridge cranes. Detailed specifications on all these items are given. Manning, Maxwell & Moore, Inc.

444 Industrial Cranes—Advantages of company's line of industrial cranes for a variety of applications are detailed in this illustrated bulletin GL-657. Along with illustrations of the cranes in action, it includes data on capacities, etc. Industrial Crane & Hoist, Ingersoll Products Div., Borg-Warner Corp.

445 Hydraulic Jacks, Pullers—Features and advantages of company's hydraulic jacks and pullers are detailed in 12-pp Catalog 59. Rated capacity tables, dimensional data and specifications are included, as well as list of accessories and equipment. Templeton, Kenly and Co.

Move Greater Pay Loads . . . Faster, Safer, With Money Saving



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Easier installation means less costly installation. Easier installation promotes better workmanship. Contractors prefer *Vibratones* because they require no special tools or fittings, because they attach readily to any outlet box, and because they involve no tuning or complicated adjustment.

This is but one of dozens of advantages of the *Vibratone* over other horns. *Specify FEDERAL Vibratones* on your signal installation. Investigate. Ask for bulletin #105.

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Looks good, does better. Perfect cutting, reaming, threading fast . . . and easy! Three tools operate independently . . . swing up out of the way for short pipe chucking from front. Slip-proof Speed Chuck is a great performer. Concealed oil system, automatic shut-off nozzle. Quick-opening die head sets to size right in machine. Power?. . . RIDGID-built motor handles 2" pipe, conduit, bolt, rod—and 12" geared tools easily. Try it, compare it . . . and you'll understand its enormous popularity! Leg and wheel stands available. At your Supply House.

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DATA FILE

(Begins on page 276)

446 On Spiral Conveyors—Described in 60-pp Catalog 951 are spiral conveyors and fittings for meeting practically any requirement and operating conditions. Four principal types—helicoid, sectional flight, ribbon flight, and cast iron—are listed along with special types. Selection tables list materials which can be effectively handled in a spiral conveyor, giving weights, loading classifications, characteristics and horsepower factors. Data on spiral feeders is provided. Also listed are unit drives, along with tables for drive selection. The Jeffrey Mfg. Co.

447 Vibrating Conveyors—Advantages and features of vibrating conveyors are detailed in 16-pp Catalog 66. Layouts and flow charts showing how conveyors can be designed to perform a wide variety of processing operations at the same time the material is being conveyed are included. Ajax Flexible Coupling Co., Inc.

448 For Bulk Material Handling—Conveyor-elevators for bulk material handling are illustrated and described in 62-pp Bulletin 358. Advantages of the conveyor-elevator units are detailed, as well as materials handled, typical arrangements, and different types available for a variety of handling requirements, and dimensional data, capacities, diagrams and photos of typical installations included. Stephens-Adamson Mfg. Co.

449 Chain Conveyor—Overhead chain conveyor systems are illustrated and described in 36-pp Catalog A-570. Includes information on track and chain, chain attachments, trolleys, vertical track curves, roller turns, traction wheel turns, take-up units, drive units, as well as engineering details, wiring diagrams, installation instructions, and chain pull calculation. Richards-Wilcox Mfg. Co.

450 For Materials Handling—Specifications and illustrations on two-wheel trucks dollies, wagon trucks, platform and shelf trucks, and many styles of casters, jacks and semi-live skids are given in 12-pp Bulletin 59G. Also included are specifications on demountable rubber tired, plastic, and pneumatic wheels. Nutting Truck and Caster Co.

451 Automatic Bulk Handling—Bulletin 531, 12-pp, on new techniques for automatic bulk handling describes pneumatic conveying methods in integrated manufacture. Describes two polyethylene handling installations to show how a system approach to air conveying solves complex handling problems. Dracco Div., Fuller Co.

452 Pneumatic Conveyors—Twelve-pp Bulletin M-588 describes a line of air conveying equipment and systems from low density-low pressure type to the highest density-high pressure type. Includes dimensional and capacity data, drawings of common arrangements. The Day Co.

453 Adjustable Ramps—Contained in this 8-pp bulletin is detailed information on a line of powered adjustable ramps for loading docks. Factors to be considered when selecting a leveling device to meet varying operating requirements are covered. Rowe Methods Inc.

454 Self-Dumping Hopper—Described in Bulletin 260 is a self-dumping hopper for low-cost handling of wet or dry, hot or cold, bulk materials. Roura Iron Inc.

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455 Materials Handling Hose—Presented in Bulletin S-5121 is a line of materials handling hose for industrial applications. These include use in sand blasting, for steel shot blasting, for industrial vacuum cleaners, and for blowing insulation into walls. The Goodyear Tire & Rubber Co.

456 Industrial Casters—Catalog 159 contains 24-pp of illustrations, descriptions and specification data on swivel-plate and rigid-plate truck casters for industrial applications. Includes detailed information on spring-action casters, V-grooved casters, grease-sealed casters, scaffold casters, floor truck locks, industrial wheels, and others. Faultless Caster Corp.

457 Caster, Wheel Manual—Featured in 192-pp Manual 65 is comprehensive information on company's complete line of casters, wheels, glides, desk shoes and accessories. Profusely illustrated with photos and dimensional drawings and diagrams of the various types of casters and wheels for a variety of applications, the manual contains tabulated engineering and price data. Darnell Corp.

DUST, FUME CONTROLS

459 Dust and Fume Control—Applications of company's dust and fume control systems in ceramic, foundry, grain, metal, steel and wood industries are illustrated and described in 50-pp Bulletin PE1-2. De-

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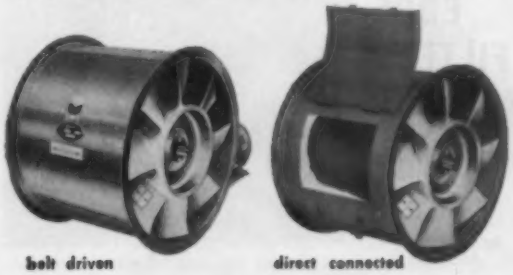

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DATA FILE

(Begins on page 276)

sign and specification data on centrifugal collectors and units are included. The Kirk & Blum Mfg. Co.

460 **Industrial Dust Control**—A wide variety of collection methods for industrial dust control is described in 16-pp Bulletin 922. A typical case history is included as well as photos, cutaway views, drawings and capacity data. Pangborn Corp.

461 **Dust Control Systems**—Bulletin 104, 36-pp, on company's dust filters, gives detailed information about dust control systems and how to engineer them. Includes description of the Roll-Clean Dynaclone dust filter, as well as information, capacities and dimensions for other dust filters. The W. W. Sly Mfg. Co.

SAFETY, SANITATION

463 **Fire-Resistant Fluids**—This series of specification sheets describes company's line of fire-resistant fluids, including synthetic, oil-water emulsion, and glycol types. Physical characteristics and other data given. Mobil Oil Co., Inc.

464 **Functional Color Kit**—Selection of paint colors to promote efficiency, safety and morale in industrial plants is among the subjects covered in this Functional Color Kit. Color specifications for mechanical areas, drafting rooms, wash rooms, cafeterias, etc., are illustrated and explained, and a set of 36 color chips of recommended paint colors, identified by number and showing reflectance percentage of each, are included. Colorizer Associates.

465 **Special Fire Protection**—Devoted to special hazard fire protection, this 44-pp booklet covers both equipment and methods. Tells how to recognize special fire-hazardous conditions in a plant. Discusses in detail major types of fire protection, telling how each functions, giving its advantages and limitations, and illustrating some examples of successful use. Two features of interest are a discussion of fire itself and an at-a-glance selector chart. Grinnell Co., Inc.

PUMPS AND COMPRESSORS

466 **Continuous Flow Pump**—Bulletin 30-C, 8-pp. outlines advantages of company's Moyno pumps which handle a variety of materials—from free-flowing liquids to non-pourable pastes, abrasives, solids. Describes principle of operation, discusses performance, construction, capacities. Robbins & Myers, Inc.

467 **Single Suction Pumps**—Ball bearing single suction pumps are illustrated and described in 24-pp Bulletin 976-H. General data and specifications are included, as well as rating tables, outline dimensions, sectional reference drawings. Buffalo Pumps, Div. Buffalo Forge Co.

468 **Non-Clog Pumps**—Bulletin P10-B41 describes a line of non-clog pumps for industrial processing, waste handling and sewage applications. Diagrams illustrating general arrangement are included, as well as tables of dimensional data, selection charts. Western Machinery Co.

469 **Centrifugal Pumps**—Catalog A-156 describes and illustrates company's line of double-suction single-stage centrifugal pumps. Features are detailed, and cross section drawing and construction details are included. C. H. Wheeler Mfg. Co.

470 **Centrifugal Pumps**—Two-stage centrifugal pumps designed for a wide range of heavy-duty pumping applications are illustrated and described in 16-pp Bulletin Form 7062-D. Details of impeller design and arrangement are illustrated with cross sectional views, and tables of performance characteristics are included. Ingersoll-Rand Co.

471 **Liquid Pumps**—Heavy-duty liquid pumps for pumping paints and inks as well as other abrasive liquids are described in Data Sheet SP-507. Features are illustrated and dimensional data and specifications included. Viking Pump Co.

FILTER TIPS

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For filtration from 25 microns up with almost no maintenance at all, you can select Purolator metal edge filters made of all common metals and alloys with flows from 1 to 1000 GPM. They will withstand temperature extremes from −260° F. to 1200° F. and differential pressure to 125 PSI. Their metal edge elements provide a thin-walled, rugged medium with a lower initial pressure drop, higher flow and complete utilization of surface area. They can be cleaned almost indefinitely — with knife blades (manual or motorized), or by backwashing. Write for *free* catalog today to:

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The Purolator P32 Micronic Filter series is a versatile line of medium size fluid filters for hydraulic oil filtration. It can also be used in a wide variety of applications, and with a wide range of fluids.

Features include:

- The Purolator Micronic® Filter . . . resin impregnated cellulose, preformed and pleated for greater filtering area.
- This filter can be furnished with one or two elements, as desired.
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- All units will withstand line surges up to 150 lbs., and provide a leakproof seal when used on suction side of the pump.

Send for details and data, or write us the particulars of your problem. We'll be glad to help. Write to Dept. P12-32.

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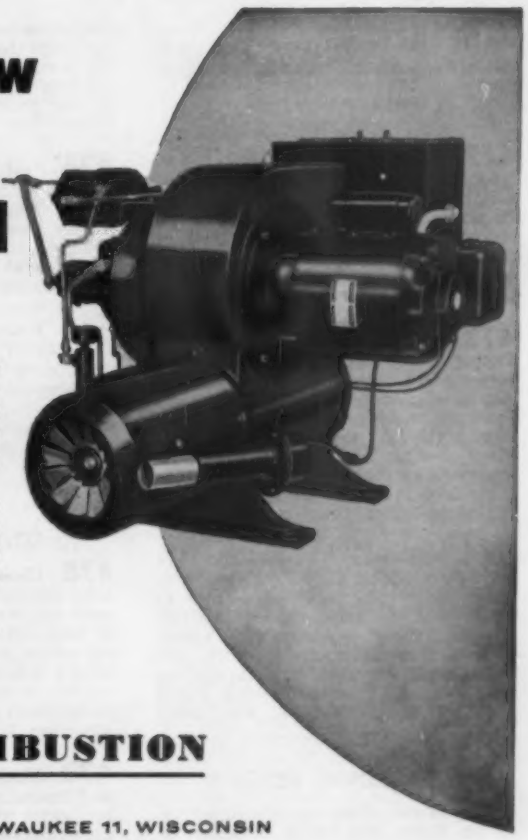
Keep heating costs low with HEV-E-OIL commercial-industrial burners



Hev-E-Oil burners furnish all the air necessary for combustion, assuring perfect fire control under all weather conditions. Low fire start that builds up gradually to the flame size required means smooth, safe operation. And once the burner is set for greatest efficiency, it *stays* that way no matter what the weather.

A complete package! Fire tested! Automatic, electronic controls. Meets all codes. Easy to install . . . Hev-E-Oil models from 5 to 150 gph. Also available, Hev-E-Duty power gas burners and combination gas/oil burners from 720,000 to 21,000,000 B.T.U.

For more information write Industrial Combustion, Inc., 4507 N. Oakland Ave., Milwaukee 11, Wis., Dept. PE-360.

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Check the Yellow Pages under "Tools-Electric" for the location of the nearest Black & Decker factory service branch or authorized service station.

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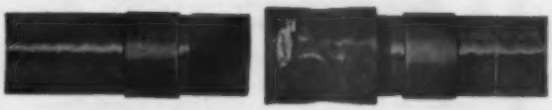
fiber-glass reinforced epoxy pipe by Amercoat®



. . . strong as steel pipe, only one-eighth the weight. Tensile: hoop 80,000 psi, longitudinal 40,000. Highly corrosion resistant. Won't scale, cold flow or deform. 20-foot lengths easy to cut and join; threaded or locking wedge fittings.

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DATA FILE

(Begins on page 276)

472 Industrial Compressors—Oil-free heavy-duty industrial compressors are illustrated and described in 12-pp Bulletin A-92. Cutaway views show details of internal design and construction, and bulletin includes photos of typical installations, specifications and other data. Joy Mfg. Co.

473 Water-Cooled Compressors—Featured in 12-pp Bulletin WB10 are two-stage water-cooled air compressors designed to meet the demand for small machines having efficiencies comparable to those of large two-stage horizontal compressors. Cutaway views showing component features are included, as well as general data tables. Gardner-Denver Co.

474 Stationary Compressors—Sixteen-pp Catalog 5910 describes features and advantages of a line of stationary air compressors designed for a variety of industrial needs. Tables of weights, code words, and dimensions are included, as well as schematic diagrams, cutaway views showing design details, and other data. Schramm, Inc.

PACKINGS, SEALS

475 Metal Packing—Featured in 24-pp Form AD-166 is detailed information on selection of metal packings for use wherever gas or air is compressed or expanded. Covers free-floating metal packings, metal rod packing rings, metal scraper rings. The Garlock Packing Co.

476 Self-Lubricating Packings—Featured in this 30-pp Bulletin PC-103 is detailed information on company's line of packings with internal lubrication. Application chart, table of physical properties, and ordering instructions. Greene, Tweed & Co.

477 External Mechanical Seal—Bulletin CP-551 features a mechanical seal designed for complete interchangeability with packing in stuffing boxes of pumps and other rotating processing equipment. Cutaway drawings and an installation diagram are provided. Chemical and Power Products, Inc.

OTHER EQUIPMENT

478 Classifying Systems—This bulletin covers major advantages, industrial applications and design features of high efficiency classifying systems for efficient separation or dedusting of dry powdered materials. Includes details on operation, flexibility or arrangement, power requirements, construction. Buell Engineering Co., Inc.

479 Water-Cooled Stoker—Design and operating advantages of the Vibra-grate Stoker are outlined in this illustrated bulletin. A large cutaway view details component parts of the stoker. American Engineering Co.

480 Industrial Finishing Equipment—Catalog A659, 12-pp, describes modern finishing system for cleaning, rust proofing, drying, painting and finish baking. The R. C. Mahon Co.

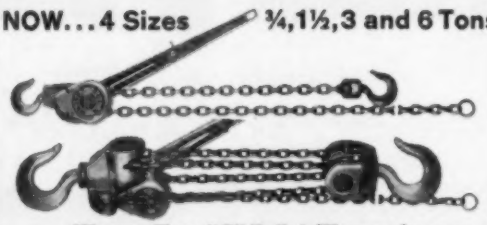
481 Paint Finishing—Six articles on factors to consider when planning a paint finishing system are contained in this 24-pp reprint. They cover conveying systems, layout, equipment for metal preparation, ovens, methods of paint application, and auxiliary equipment. Many photos are included, also line drawings illustrating a typical layout and giving details of five stages of metal cleaning and preparation. J. O. Ross Engineering Div., Midland-Ross Corp.

482 Fighting Corrosion With Corrosion—Cathodic protection against rust and corrosion is the subject discussed in this illustrated 10-pp bulletin. Describes the corrosion battery, corrective measures. Electro Rust-Proofing Corp.

483 Silicone Products—The 1959 Reference Guide to company's silicone products tells which silicones can best meet the needs of a variety of problems ranging from adhesives to release agents, resins to rubbers, dielectrics to water repellents. Contains graphic examples of typical applications, as well as detailed selection data. Dow Corning Corp.

New ¾-ton Type "C" Pull-A-Way

NOW...4 Sizes ¾,1½,3 and 6 Tons



WRIGHT Type "C" Pull-A-Ways make easy work of hundreds of quick hook-up jobs. Now available in four sizes—¾, 1½, 3 and 6 ton—Type "C" Pull-A-Ways are portable, safe and rugged. Corrosion-resistant modern aluminum alloy castings are used for gear case, handle and covers of all models. Hooks, load chain and chain sheave are made of alloy steel. Positive, dependable load brake securely holds load at any point. Lubricated for life. Weights: ¾-ton, 14 lbs; 1½-ton, 23½ lbs; 3-ton, 36½ lbs; 6-ton, 63 lbs.

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WRIGHT HOISTS

Wright Hoist Division • American Chain & Cable Company, Inc. ACCO

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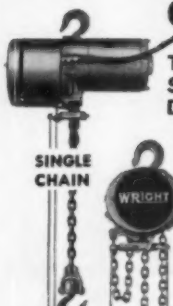
Light, Low-Cost Electric Chain Hoists



Two Capacities:
Single Chain–300 to 2000 lbs
Double Chain–3000 to 4000 lbs

The WRIGHT Electric Chain Hoist has fewer moving parts than any other chain-type electric hoist. Result: hoist working efficiency is increased, maintenance costs are decreased. This rugged, compact hoist features a double braking system—self-locking worm gear reduction, easy to adjust motor brake. Hoisting gears are made of high grade phosphor bronze—worms are heat treated alloy steel. All gears operate in a continual oil bath. Alloy load chain is wick lubricated for long life, heat treated for resistance to wear. Factory tested at 50% of overload.

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484 **Industrial Stack**—Detailed information on a permanent, low cost refractory smoke stack for commercial and industrial applications is contained in 8-pp Bulletin IS-32. Gives product information, applications with boilers, furnaces, etc. Van-Packer Co., Div., The Flinkote Co.

485 **Automatic Air Products**—Featured in 22-pp Bulletin 157 are automatic air products, including separators, afterdriers, filterators, filters, line drains, governors and kits, combinations, regulators, and lubricators. Advantages are detailed and operation described. Wilkerson Corp.

486 **Special Equipment**—Featured in Bulletin 7-A is a line of custom-engineered air and hydraulic operated machines for a variety of industrial operations. Details of design and operation are described. Logansport Machine Co., Inc.

487 **Industrial Burners**—Advantages of company's industrial burners are detailed in illustrated Bulletin 3. A number of different types for a variety of applications are described and data tables are included. Industrial Combustion, Inc.

488 **Duct Insulation**—Thermal and acoustical duct insulation made of long textile-type glass fiber is illustrated and described in this 8-pp Bulletin ULD-859. Includes detailed application specifications, data on characteristics of the duct liners, thermal efficiencies, sound absorption data. Gustin-Bacon Mfg. Co.

489 **Chain Link Fencing**—A comprehensive review of aluminum's role in the growing fence market today is presented in this 12-pp booklet. Outlines details of typical installations of aluminum chain link fence. Complete technical data on strength, resistance to corrosion, and durability is presented. Tensile strengths, as well as suggested aluminum alloys, are included. A companion publication gives suggested specifications. Aluminum Co. of America.

490 **Aluminum Coated Wires**—Described in 6-pp Folder DH-537B are aluminized steel wire and wire products, including steel core wires, steel strand guy wire, overhead ground wire, toe wire, messenger wire, telephone wire, chain link fabric and barbed wire. Properties and applications listed. Page Steel & Wire Div., American Chain & Cable Co., Inc.

491 **Elastomer Coated Fabrics**—Detailed information on synthetic elastomer coated fabrics is presented in this 12-pp bulletin. Physical properties and tests of the various synthetic fabrics, applications and specifications are covered. E. I. du Pont de Nemours & Co., Inc.

492 **TV at Work**—This 8-pp brochure, "How Many Jobs," covers an extensive line of industrial television equipment. Shows cameras, control units, monitors, accessories, and projection systems. Varied applications, including installations with unusual engineering requirements are pictured. General Precision Laboratory.

493 **Tube Fittings and Hose**—Comprehensive data on brass and steel tube fittings, tube working tools, hose, hose ends and assemblies most frequently used in hydraulic and pneumatic systems is presented in 16-pp Catalog C-301. Tables list complete selection data. The Weatherhead Co.

494 **Steel and Aluminum Data**—This new 256-pp edition of company's Data Book includes aluminum analyses, characteristics, mechanical properties and tolerances, in addition to information on steel such as machining and fabricating data, manufacturing practices and tolerances, weights, safe loads, ASTM standards, compositions and properties, and miscellaneous facts of practical value. Book is available to qualified plant engineers. Please state your job title when requesting it. Joseph T. Ryerson & Son, Inc.

495 **Product Directory**—Product Directory G-103 covers company's divisions and products. Products are divided into major sub-groups—chain link fence, chemicals and coke, springs, belts, wire, wire cloth, etc. Brand names are given, as well as applicable reference literature. The Colorado Fuel and Iron Corp.

WRIGHT Safeway Hand Hoists—In 12 Sizes —½ Ton to 50 Tons

WRIGHT Safeway Hand Hoists are built to take it—inside and out. Sealed construction protects all vulnerable parts in high analysis steel housing. Gears, pinions, drive spindle (also top and bottom hooks) are nickel-chrome-molybdenum alloy steel mounted on anti-friction bearings. Gear train is enclosed in oil-tight chamber. Load wheel, with 5 or more pockets, can be reversed for double life. Alloy steel load chain is heat treated to resist wear, ductile to withstand shock loads. Weston type load brake. Factory tested at 50% overload. Write to our York, Pa., office for Bulletin DH-164C.

WRIGHT HOISTS

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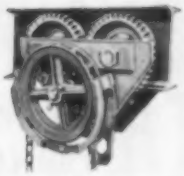
Smooth-Running Timken Roller Bearing Trolleys

Plain Timken Trolley



Geared Timken Trolley

WRIGHT Timken Roller Bearing Trolleys (shown), in plain or geared models, provide smooth, safe handling of ¼ ton to 40 ton loads with minimum of effort. Heavy steel side plates and chilled tread wheels revolve on Timken Bearings (two bearings to each wheel). Tapered bearing design absorbs both thrust and radial loads and thereby reduces the work required to move the trolley along I-Beam. Chilled wheel treads wear longer, assure wheel roundness. Wright Self Aligning Roller Bearing Trolleys in ½ ton to 20 ton models are also available.

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WRIGHT TROLLEYS

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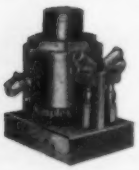
81 hydraulic models to choose from!
THE WORLD'S MOST COMPLETE LINE

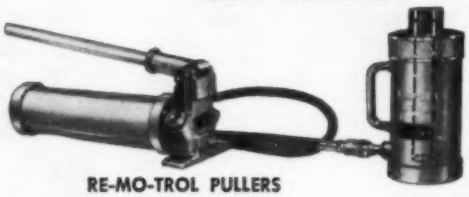
SIMPLEX
HYDRAULIC JACKS and PULLERS



STANDARD HYDRAULIC JACKS
11 Models
1½ to 100 tons capacity
5¼" to 22" travel

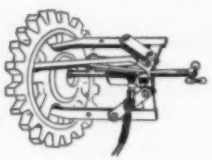
"JENNY" CENTER-HOLE HYDRAULIC PULLERS
6 Models
30 to 100 tons capacity
3¼" to 10" travel

ROL-TOE FOOT-LIFT HYDRAULIC JACKS
3 Models
10 to 50 tons capacity



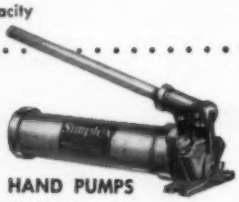
RE-MO-TROL PULLERS
Solid and Center-Hole Rams
39 Models
10 to 300 tons capacity

HYDRAULIC SERVICE and BUMPER JACKS
9 Models
1¼ to 20 tons capacity
13½" to 19" travel



HYDRAULIC PULLERS
4 Models
20 and 30 tons capacity
Push-Pullers, Double and Triple-Grip Pullers

POWERED PUMPS ELECTRIC, GAS OR AIR – 6 Models



HAND PUMPS
3 Models

Look for further information on Lever and Screw Jacks in other advertisements.

TEMPLETON, KENLY & CO.
2561 Gardner Road
Broadview, Illinois

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INSULATION LASTS LONGER, WORKS BETTER WITH FLINTKOTE INSULATION PROTECTIVE COATINGS!

For outdoors against weather or indoors against vapor or moisture, use these specially designed thermal insulation coating products.

- Flintkote C-13-A—an asphalt base clay emulsion for a breathing type of coating.
- Thermalkote*—weather resistant asphalt mastic for heavy duty over wire-held insulation.
- Flintkote C-19—a non-breathing, vapor sealing cutback asphalt coating.
- White Insulation Coating—for interior refrigerations.

For full particulars including light reflective finishes for asphalt coatings write: The Flintkote Company, Industrial Division, 30 Rockefeller Plaza, New York 20, New York.

*Reg. U.S. Pat. Off.

FLINTKOTE

Manufacturer of America's Broadest Line of Building Products

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1 man handles Sheet Steel Faster, Easier with a C-F LIFTER

C-F Lifters, under one man operation, pick up, carry and unload more sheet steel tonnage per hour than any other method – and at lower cost per ton. Wide carrying angles hold sheets securely – won't damage high grade sheets; tong action insures safe carrying; fast opening and closing adjustments of Lifter jaws permit shifting from one size pack to another in seconds. C-F Lifters are made in standard or semi-special models to handle from 2 to 60 tons.

Write for Bulletin SL-30 for specific examples of C-F Lifter operation and economy.

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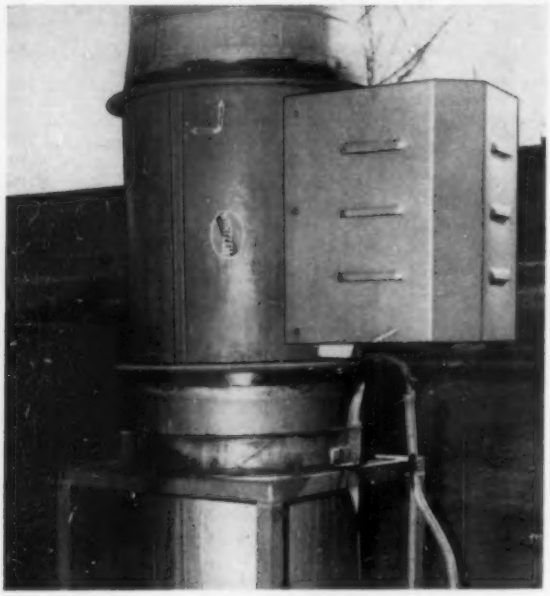
NEW HARTZELL

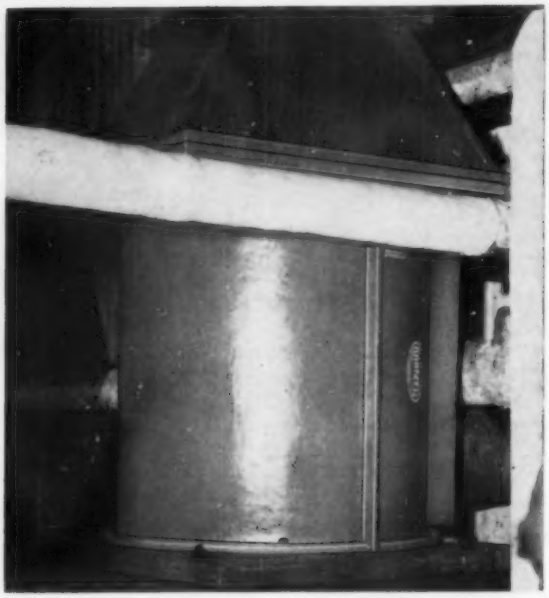
FIBERGLASS DUCT FANS OFFER

UNSURPASSED RESISTANCE TO CORROSION

. . . and at a cost substantially below that of stainless steel or monel construction



At the Paramount Plating Company, Newark, N. J. this Hartzell fiberglass duct fan exhausts fumes from over a vat containing 90% phosphoric and 10% nitric acid at 180°-200°F. In use approximately 30 hours a week for well over a year, the fan is still as good as new. And corrosion damage within the plant has been sharply curtailed.



At the Verona Pharma Chemical Company, Newark, N. J. this Hartzell fiberglass duct fan draws fumes off a tank containing hydrochloric acid. Fan runs eight hours a day in conditions so corrosive that the motor has to be mounted outside the building, but it shows no signs of deterioration after nearly two years of service.

Corrosion resistance far above that which can be achieved with specially coated steels! Cost far below that of stainless steel or monel construction . . . and corrosion resistance which equals or exceeds that of stainless or monel!

That's the story in a nutshell on the new Hartzell fiberglass duct fan. (Propeller, duct section drive housing and bearing cover are fiberglass; drive shaft and bearings are stainless steel.)

And in design and performance these fans are identical to standard Hartzell belt-drive fans — same high efficiency, same exclusive features, including variable pitch drives which allow quick, easy adjustment of fan speed without removing the fan from the duct work. Hartzell fiberglass duct fans are now available in sizes 12″ to 36″ — 21 models in all. For details, call your nearby Hartzell field office or write for Bulletin A-116.

here's a complete line of air moving equipment designed and built specifically for industry

Other famous Hartzell products include controllable and full feathering propellers for light aircraft, crop drying equipment and farm ventilating fans.

HARTZELL PROPELLER FAN COMPANY • 51 Thomas Blvd. Piqua, Ohio
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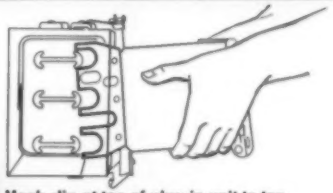
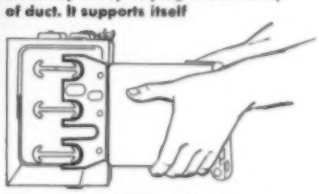
Another Reason for Using Square D Aluminum Plug-in Duct...

SQUARE D PLUG-IN UNITS GIVE YOU EXCLUSIVE *hook-swing* MOUNTING

Safer, Faster, Easier Mounting



Hook clip at top of plug-in unit to top of duct. It supports itself



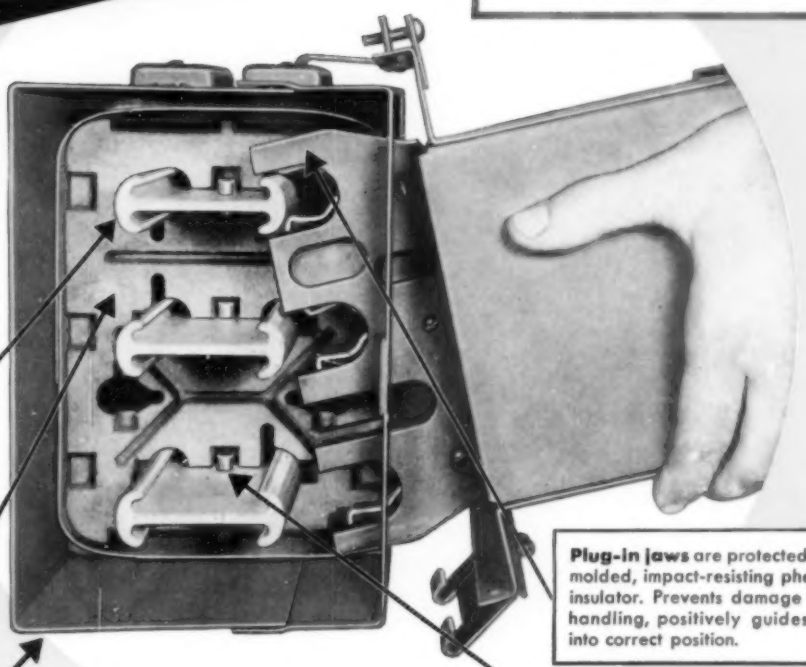
Then, just swing plug-in unit down until jaws engage bus bars

Hanger mounting (*not shown*) makes installation easy. A universal hanger permits mounting in *any* position. Just suspend and level top portion of hanger, then clip on lower portion. U.L. approved for 10-foot spacing.

I-beam construction of bus bars—a Square D exclusive—provides four times the strength of conventional bus bars. Bars are zinc, copper and silver-plated full length.

Full width bus support provides greater strength on short circuits, freedom from vibration. Also acts as fire stop where duct passes through walls and floors.

Square D duct is totally enclosed for maximum safety—no danger of accidental shorts. Prevents overheating from dust accumulation.



Plug-in jaws are protected by a molded, impact-resisting phenolic insulator. Prevents damage from handling, positively guides unit into correct position.

Steel pins in each bus bar prevent bars from shifting and support them on vertical riser installations.

With other plug-in duct, it's no easy job to mount the plug-in units. In fact, it takes a lot of real pushing which is neither safe nor easy when you're working on a ladder. With Square D's exclusive *hook-swing* mounting, you just hook the plug-in unit to the top of the duct. Then, simply swing it down and in until the jaws have engaged the bus bars. No awkward pushing required—no unnecessary chances to take.

Square D aluminum plug-in duct with exclusive *hook-swing* mounting costs no more—why settle for less?

***Write** for Bulletin SD-110. It gives the facts on Square D aluminum plug-in duct. Address Square D Company, 1601 Mercer Road, Lexington, Kentucky*

SQUARE D COMPANY

wherever electricity is distributed and controlled

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"In modern manufacturing, electrical control equipment is the very heart of mechanized and automatic operation. Because our plants have become so dependent on this equipment, the cost of 'down time' for any control failure is simply staggering. And, according to many manufacturing engineers, limit switches are the worst offenders, accounting for as much as 70% of all interruptions due to control failures."

Mr. J. S. Wilford, Editor
PRODUCTION Magazine

"At least 60% of the electrical failures causing downtime of the production machinery used in manufacturing home appliances at the Whirlpool Corporation can be traced to faulty limit switch operation. An analysis of the switch failures reveals the inability of limit switches to meet the requirements of high production equipment such as is widely used in our St. Joseph Division."

Mr. C. R. Burg, Maintenance Engineer,
Whirlpool Corporation

"75% of the electrical failures on our machines can be traced directly to limit switch malfunctions. This problem is particularly aggravating to us because we are responsible for the successful operation of our machines, and their components on our customer's floor. We have spent a great deal of time engineering protective mounting schemes to compensate for the inability of today's limit switches to check the seepage of corrosive coolants and microscopic grit."

Mr. N. P. Bashor, Director Electrical Division,
W. F. & John Barnes Company

PRODUCTION'S ENEMY #1 MEETS ITS MASTER

Cutler-Hammer announces the first

- ***Tolerance Compensated***
- ***Contamination-proof***
- ***Visible Contact***

Extended Life Limit Switch

The new Cutler-Hammer Extended Life Limit Switch installs easier, works better, and lasts longer than any of the "oil-tight" limit switches now in use. Exhaustive tests, including total-submersion life tests, confirm this fact! But don't take our word for it. Try it . . . Test it . . . Compare it. The new Cutler-Hammer Extended Life Limit Switch is completely interchangeable with any widely used limit switch. Replace your most troublesome limit switch installation with this new tolerance compensated, contamination-proof, visible contact Cutler-Hammer Limit Switch; and it will work better, last longer than any other you have ever used. This is the answer to your limit switch problems.

For descriptive data write for Publication ED143-E274. Cutler-Hammer, Inc., Milwaukee 1, Wisconsin.

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